Hardware User Manual

(Manual Part Number MAN-UT-MARQUEE, Rev. 1)

WARNING!

Programmable visualization products such as the ToughMarquee are not fail-safe devices and as such must not be used for stand-alone protection in any application. Any reliance on these devices for equipment or personnel safety is unwarranted.

The diagrams and examples in this user manual are included for illustrative purposes only. The manufacturer cannot assume responsibility or liability for actual use based on the diagrams and examples.

WARNING: If the Marquee is used in a CLASS I, DIV. 2 environment, the following conditions must be met: Class I, Div. 2 methods; AND — must conform to all rules and requirements of applicable jurisdictions regarding Class I, Div. 2 installations; ALSO — peripheral equipment controlling this device or being controlled by it shall be suitable for service in the location in which they are used. Failure to comply with any of the above installation requirements will invalidate the device's qualifications for service in CLASS I, DIV. 2 hazardous locations.

WARNING: EXPLOSION HAZARD — substitution of components may impair suitability for CLASS I, DIVISION 2.

WARNING: EXPLOSION HAZARD — do not disconnect equipment unless power has been switched off or the area is known to be non-hazardous.

MANUFACTURED and MARKETED   by   UTICOR TECHNOLOGY, L. P.

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EU Compliance Information

The ToughMarquee is manufactured in compliance with European Union (EU) Directives and carries the CE mark. The ToughMarquee has been tested under CE Test Standard #EN55011, and is submitted for approval. The following information is provided to comply with EU documentation requirements.

Please NOTE:

>   Products with CE marks perform their required functions safely and adhere to relevant standards as specified by EU directives provided they are used according to their intended purpose and that the instructions in this manual are adhered to. The protection provided by the equipment may be impaired if this equipment is not used in accordance with this manual. Only replacement parts supplied by UTICOR Technology, L.P. or its agents should be used.

Technical Support

>   If you need assistance, please call our technical support at
>   or **FAX** us at   .

SELV Circuits

>   All electrical circuits connected to the communications port receptacle are rated as Safety Extra Low Voltage (SELV).

Environmental Specifications

Operating Temperature:	0° – 55° C Ambient
Storage Temperature:	40° – 95° C Ambient
Operating Humidity:	10 – 95% R.H., non-condensing
Air Composition:	No corrosive gases permitted
Preventative Maintenance: :::	

Purpose of this Manual

Manual Part Number : MAN-UTIC-MARQUEE   Revision 1
Manual Title : ToughMarquee User Manual

Purpose of the Manual

This ToughMarquee User Manual will give you all the information necessary to install the ToughMarquee and the ToughSmartMarquee in a fixed location in your work environment, and how to wire it to other components in your control system. Included are mounting diagrams and instructions for installation, Connections and Wiring requirements, ASCII instructions, Maintenance Information, and Troubleshooting.

This manual is a good reference guide for those who install the Marquee, as well as those who program it. If you understand the ToughMarquee, or marquees in general, you can find all the information you need to start and maintain your system in this manual.

The following table provides you with updated information. If you call technical support with a question about this manual, please be aware of the revision number and date.

Revision	Author	Date	Effective Pages	Description of Changes
Original Release	EG/ECF	October, 2008	All	Original Release of Manual

Manual Organization

The information below provides an overall description of the topics covered within this manual.

Chapter 1: Getting Started

Provides Manual Organization and lists what you need to get started to display messages. Gives you a quick reference to get familiar with your ToughMarquee/ToughSmartMarquee. Discusses how to get help with questions you might encounter and how to contact Technical Support.

Chapter 2: Models and Equipment

Provides you with a table listing the various models, their part numbers and special features. Lists the important features and hardware specifications for different models.

Chapter 3: Installation, Wiring and Connection Information

Provides information about preparing the marquee for operation such as setting the DIP switches, connecting Power and how to interface ToughMarquee for Serial communication. Shows the mounting and cutout dimensions for the different models. Explains the different ways to mount the marquee. Shows the setup screens displayed after initial power up of the display.

Chapter 4: ASCII Instructions and Software

Describes different ASCII commands to develop and maintain ToughMarquee programs. Describes the ToughMarquee String Generator software which can be used to preview messages and generate ASCII strings.

Chapter 5: Connectivity to PLCs

Shows how you can configure various PLCs to output messages to the ToughMarquee.

Chapter 6: Connectivity to Control Network

Shows how you can connect ToughMarquee to Ethernet, DeviceNet, or Profibus.

Table of Contents

CHAPTER 1: GETTING STARTED

1.1 Installing the ToughMarquee - Overview

This section is designed to take you through a quick start on how to use the ToughMarquee. It assumes that you are a first-time user of ToughMarquee. By following the 3 Simple Steps, you will be creating and displaying messages on your ToughMarquee in no time.

Mounting	The ToughMarquee is a suspension mount unit. Please refer to the beginning of **Chapter 3:Installation** for environmental factors, hardware requirements and instructions.

Connections & Wiring	Once your ToughMarquee is mounted, you are ready to connect your unit to the power source, PLC, and other devices. Note that the ToughMarquee is a AC powered unit (120/240 VAC). For more details, refer to **Chapter 3, Wiring and Connections.**
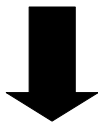
Setup Mode	Download and install the ToughMarquee software (**Chapter 4**). Connect your Marquee to a PLC (**Chapter 5**). Begin to send messages to your Marquee!

1.2 What You Need to Get Started

1.2.1 Hardware

- A ToughMarquee display
- 110/220 VAC input power cord* with stripped wires on one end
- RS-232C Programming Cable* with standard 9-pin connector on one (PC) end and the other end unterminated (3 stripped wires to connect to the ToughMarquee terminal strip)

- ◆ Ethernet cables as required
- ◆ PC requirements:
- ◆ IBM or compatible PC (Pentium or better) with a mouse and separate serial port (USB port may be used with a Serial to USB converter)
- ◆ Display with at least 800 x 600 resolution (1024 x 768 recommended)
- ◆ Standard Windows XP/Vista® operating system
- ◆ CD ROM Drive
- ◆ ToughMarquee User Manual

    [*You may have to make these cables by cutting the termination off one end each of standard 110/220 VAC and RS-232 PC cables]

1.2.2   Software

- ◆ ToughMarquee software (P/N :::MAN-UTICW-CD:::)
                :::and/or:::
- ◆ SmartToughMarquee Software (P/N :::MAN-UTICW-CD:::)

The ToughMarquee string generator software, and the ToughSmartMarquee control and message programming software, can be downloaded of cost by following these steps:

1. Go to **www.uticor.net**
2. Click on **Downloads** at the top of the page.
3. Scroll down to ToughMarquee or ToughSmartMarquee
4. Right click on the appropriate software title and save it to your computer.
5. Install the Marquee/SmartMarquee software on your computer.

1.3   Need Help?

Help is never more than a mouse click or a key press away!

1.3.1   On-screen Installation HELP

In addition to this manual, Installation Guidelines and Diagrams can also be found in the HELP of the ToughMarquee Programming Software. To access these Help windows, click on "Help" in the Menu bar of the ToughMarquee, select "Help Topics", and then click on the "Contents" tab. One of the topics displayed will be "Hardware Installation", and it contains all the essential information needed, including dimensions, mounting instructions, connection and wiring setup.

1.3.2 On-screen PLC HELP

You can also consult the ToughMarquee Software HELP if you need help with the PLC to ToughMarquee Interface, or any other communications or wiring issue. Also included are instructions and ASCII guidelines for message formatting and syntax.

1.3.3 Technical Support

Although most questions would be answered with this manual or the HELP within the ToughMarquee Software, if you are still having difficulty with a particular aspect of installation or

.

CHAPTER 2: MODELS AND EQUIPMENT

2.1 Product Overview for the Uticor ToughMarquees

ToughMarquees are available in two distinct models:

ToughMarquee: these are "slave" marquees, that is they do not store any messages. They simply display the messages sent to them by a PLC, PC, Embedded Controller, or a Master Marquee.

ToughSmartMarquee: this is the Master Marquee model; it monitors connected devices, such as PLCs, and is capable of issuing string messages or Triggering messages based on external events to other marquees and devices.

ToughMarquees are the most sensible marquees for stand-alone and Plant-wide communication displays with large character sizes so that the messages are visible up to 400 feet. Character visibility can be enhanced by scrolling or blinking the message. The Marquees are offered in 14 different models, each with Red or Tri-Color LEDs, to suit every application. You can display messages in 2", 4", 6", 8" and 8" Narrow characters. All ToughMarquee models are capable of communicating over RS-232 and RS422, and are expandable for Ethernet communications. All but the smallest unit (the 1L20C) are also expandable for DeviceNet and Profibus connectivity. The SmartMarquees have further expandability for CCLink, DH+ and Remote I/O, Modbus Plus. ToughMarquee can be interfaced with PLCs, PCs, and embedded controllers. All ToughMarquees support ASCII protocol. You can also take advantage of ToughMarquee's International Character Set to display your messages in multiple international languages.

2" characters - readable from 100 feet
4" characters - readable from 200 feet
6" characters - readable from 300 feet
8" characters - readable from 400 feet
8" Narrow characters - readable from 400 feet

1L refers to one line or "row" that equals 20 characters (each 2" high). 20C refers to 20 characters, all of which are 2" high.
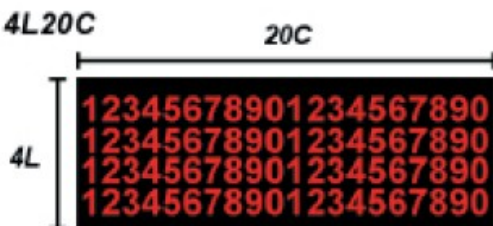
ToughMarquees are available in several sizes. The smallest size is called the 1L20C. The other sizes are multiples of the smallest size, such as the 4L20C (shown above), and the 2L40C (which has two lines of text but is twice the length; thus supporting twice the number of 2" characters per line),etc. See chart on **Page X** for a complete listing of sizes, with their full range of text possibilities.

2.1.1   Physical Characteristics

:::*Need info for Welded Steel housing*::
:::ToughMarquees are enclosed in NEMA 12 or NEMA 4 extruded aluminum housing, or a NEMA 4x Welded Steel housing, with NEMA ICS 2-230 level of electrical noise immunity. Two grommets are provided for routing wires through the back access plate. The connectors and set-up switches can be accessed by removing the back access plate.
ToughMarquee can be mounted in three different ways. It can be mounted on a wall, ceiling or on top of the machine depending upon the application. Section 4 describes the various ways to mount and install the ToughMarquee.:::

2.1.2   Messages

How messages look depends on the way they are sent. Messages have options that determine message output and visual appearance. A network of two groups of ToughMarquees with 8 marquees in each group can be set up. When the message contains group and unit number information, the message can be displayed on one, some, or on all of the ToughMarquees.
The ToughMarquee also features International Character Sets. This option is switch-selectable to allow message display in U.S., English, French, Danish, Swedish, German, Cyrillic, or Japanese Kana.

2.1.3   Where to Use ToughMarquee Displays

Using ToughMarquees is an excellent way to keep workers in touch with the manufacturing process via the following:
- Monitor Productivity of each machine, line, or the whole plant
- Communicate Alarm and Safety Messages
- Provide Continuous Reports on Factory Conditions

2.2   ToughMarquee Part Numbering System

$$\text{TSM - XLXXC - X - X - X - X - X - X}$$
$$\quad\quad 1 \quad\quad 2 \quad 3 \quad 4 \quad 5 \quad 6 \quad 7$$

1. Size of display:
   XLYYC, where "X" = the number of lines of text, and "YY" = the number of characters per line. For example: **4L20C** = 4 lines of text, with a maximum of 20 characters per line. *See chart on page X for a full breakdown of unit sizes, with their display features, dimensions, weights, etc.*

2. Text Color:
   R - Red
   T - Tricolor

3. Master or Slave:
>   **M** - Master
>   **S** - Slave

4. Option card for Master or Network Interface for Slave**:**

Master options -	**Slave options -**
0 - No card selected: RS232, RS422/485 & Ethernet ports	**0** - No card selected: RS232, RS422/485 & Ethernet ports
C - Mitsubishi CCLink	**D** - DeviceNet
D - DeviceNet	**E** - Ethernet
H - DH+ and Remote I/O	**P** – Profibus
M - Modbus Plus	
P - Profibus	

5. Type of enclosure:
>   **W** for Welded housing
>   **X** for Aluminum extrusion; *Only four models are available in* "X"*:* **2L20C, 4L20C, 2L40C, 4L40C**

6. Housing Material (Applies to Welded Steel Housing Only):
>   **C** for Cold Roll Steel
>   **S** for Stainless Steel

7. Display:
>   **H** - for high bright outdoor use marquee; only works with Red text color ("**R**" in position 2)

2.3   ToughMarquee Features

- 2" to 8" Red or Tri-Color characters
- International Character Set
- 16 Available Models starting from 1 line 10 Character per line display to 4 Line 40 Character per line display
- Ethernet, DeviceNet and Profibus Interface models
- ASCII String Generator Software
- NEMA 12, NEMA 4/4X, Class I, Div II with FDA Compliance, Aluminum or Stainless Steel Industrial enclosures
- Pre-Matched LEDs
- 24 hour Burn-in tested
- 100,000 Hours rated life
- 110/220 VAC Power Input voltage
- UL, CUL, CE, CSA Approval (pending)
- Stationary, Scrolling and Blinking Messages
- Mixed Character sizes on one Line

2.4   Optional Parts and Accessories

There are replacement parts and other optional equipment available to customize or upgrade the ToughMarquee to fit your application. The tables below provide you with a list of this equipment. Instructions, if necessary, on how to install this equipment to upgrade your unit are also provided.

To order from these lists, phone UTICOR Technology, L. P. at 1-563-359-7501.

Part Number	Description
:::ACC-UTICW-TSM	ToughMarquee Programming Software
:::ACC-UTICW-GRMT	Grommets for ToughMarquee back Plate
:::ACC-UTICW-BKBLT	Back Plate with Gasket for ToughMarquee
:::ACC-UTICW-TERM5	5-point Phoenix plug-in Terminal Block
:::ACC-UTICW-MNTBRK1	Mounting Brackets for ToughMarquee 1L20C model only (package of 2)
:::ACC-UTICW-MNTBRK2	Mounting Brackets for ToughMarquee 2L10C and 2L20C models only (package of 2)
:::ACC-UTICW-SCDRV	2-5mm Screwdrivers
:::	:::
:::	:::

2.5   Unit Specifications

General Specifications for all the ToughMarquee models are provided in the following pages.

2.5.1   General Specifications for all ToughMarquees

Enclosure:	NEMA 12, NEMA 4/4X, Class I, Div II with FDA Compliance, Aluminum or Stainless Steel
Power Supply:	115 VAC (102-132) 47-63 Hz **/** 230 VAC (194-250) 47-63 Hz
Power:	:::W
Approvals:	UL, CUL, CE Pending
Operating Temperature:	0° to 55° C (32° to 131° F)
Storage Temperature:	40° to 90° C (-4° to 140° F)
Humidity:	10 – 95% RH, non-condensing
Electrical Interference:	NEMA ICS 2-230 Showering Arc Test
Electrical Tolerance:	ANSI C37.90a-1974 (SWC) Surge Withstand Capability Test
Vibration:	5 to 55Hz 5G for 2 hours in the X, Y, & Z axes
Shock:	20G for under 12 ms in the X, Y, & Z axes

2.5.2   Options for all ToughMarquee models

Display Color:	All Marquee models can be manufactured with either Red or Tri-Color displays.
Highbright Display:	This is available for all models, but only in Red LED display.
Master/Slave:	Almost all the ToughMarquees can can function as Master Marquees with a number of control functions, as well as expanded communications options:

Slave options *(available on all models);*

RS232 and RS422/485 Serial Drivers
Ethernet, DeviceNet, Profibus

Master options *(not available on 1L20C model);*

RS232, RS422/485 Serial Drivers;

Ethernet, DeviceNet, Profibus,

Mitsubishi CCLink, DH+ and Remote I/O, Modbus Plus

2.5.3   Marquee Dimensions, Weights and Display Options, by Unit

This table shows the dimensions and weights for each Marquee model, according to the housing material selected. It also shows all standard message text sizes and the maximum number of lines and characters for each character height supported. "N" denotes "Narrow" characters.

Part Number	Housing	Dimensions: W x H x D	Weight	Possible Text Configurations (at Uniform Character Height)
2L10C	W	20" X 6.25" X 4.25"	20 lbs.	2" char.: 2 lines of 10 characters 4" char.: 1 line of 5 characters
1L20C	W	40" X 4" X 4.25"	30 lbs.	2" char.: 1 line of 20 characters
2L20C	W	40" X 11.5" X 4.25"	47 lbs.	2" char.: 2 lines of 20 characters 4" char.: 1 line of 10 characters
	X	37.05" x 7.28" x 4.18"	18 lbs.	
4L20C	W	40" X 16.3" X 4.25"	65 lbs.	2" char.: 4 lines of 20 characters 4" char.: 2 lines of 10 characters 6" char.: 1 line of 6 characters 8" char.: 1 line of 5 characters 8N" char.: 1 line of 10 characters
	X	37.05" x 12.08" x 4.18"	34 lbs.	
8L20C	W	40" X 25.9" X 4.25"	101 lbs.	2" char.: 8 lines of 20 characters 4" char.: 4 lines of 10 characters 6" char.: 2 lines of 6 characters 8" char.: 2 lines of 5 characters 8N" char.: 2 lines of 10 characters
2L40C	W	76" X 11.5" X 4.25"	81 lbs.	2" char.: 2 lines of 40 characters 4" char.: 1 line of 20 characters
	X	73.25" x 7.28" x 4.18"	34 lbs.	
4L40C	W	76" X 16.3" X 4.25"	112 lbs.	2" char.: 4 lines of 20 characters 4" char.: 2 lines of 10 characters 6" char.: 1 line of 13 characters 8" char.: 1 line of 10 characters 8N" char.: 1 line of 20 characters
	X	73.25" x 12.08" x 4.18"	70 lbs.	
8L40C	W	76" X 25.9" X 4.25"	178 lbs.	2" char.: 8 lines of 40 characters 4" char.: 4 lines of 20 characters 6" char.: 2 lines of 6 characters 8" char.: 2 lines of 5 characters 8N" char.: 2 lines of 10 characters
2L80C	W	150" X 11.5" X 4.25"	189 lbs.	2" char.: 2 lines of 80 characters 4" char.: 1 line of 40 characters
4L80C	W	150" X 16.3" X 4.25"	250 lbs.	2" char.: 4 lines of 20 characters 4" char.: 2 lines of 20 characters 6" char.: 1 line of 20 characters 8" char.: 1 line of 20 characters 8N" char.: 1 line of 40 characters

REMINDER: "W" = Welded Steel Housing, "X" = Extruded Aluminum Housing; only models

2L20C, 4L20C, 2L40C, & 4L40C are available in "X".

NOTE: You can display characters of different heights in the same line. When doing so, these configuration possibilities will change accordingly.

CHAPTER 3: INSTALLATION

3.1   Installation Considerations

Uticor products have been designed and tested for operation in the most demanding industrial environments. Modern solid-state industrial controls are complex electronic equipment that operates at low levels of voltage and current, coexisting with components that operate at much higher levels of power. The difference in operating power characteristics between the high and low power control devices creates the possibility of unwanted signals being generated causing interference. The interference, which is a by-product of electrical noise, is not present at all times. However, it appears at random and during brief periods of time can cause disruptions and errors in the operation of a control system.

Enhancement of a system's noise level immunity, and its tolerance to other environmental hazards can be accomplished by following proper system installation guidelines. The recommendations that follow are of a general nature and constitute good, solid state industrial installation practice.

3.1.1   General Environmental Installation Considerations

Avoid installing your Marquee in areas where the following conditions may exist:

- Environmental temperatures above or below those specified by the system being installed
- Prolonged exposure to humidity and liquids which may be sprayed or splashed on the equipment
- Dusty environments where airborne particles may accumulate on equipment causing reduction of heat dissipation, and reduction in effective electrical spacing between components
- Areas of excessive vibration
- Areas of high-radiated electrical noise, such as near fields of transmitting antennas and areas in close proximity of arc welding stations

3.1.2   Environmental Specifications

The following table lists the environmental specifications that generally apply to the Marquee. However I/O module operation may fluctuate depending upon the ambient temperature and your application. Please refer to appropriate specifications in Chapter 2 of the Marquee User Manual.

Parameter	Ratings
Operating Temperature	0° to 55° C (32° to 131° F)
Storage Temperature	40° to 90° C (-4° to 140° F)
Humidity	10 – 95% RH, non-condensing
Vibration Resistance	5 to 55Hz 5G for 2 hours in the X, Y, & Z axes
Shock Resistance	20G for under 12 ms in the X, Y, & Z axes
Electrical Noise	ANSI C37.90a-1974 (SWC) Surge Withstand Capability Test

3.1.3   AC Line Noise

The AC power available in house outlets and at sub-stations powering industrial and commercial applications is generally generated at a power station miles away from the point of usage. The power is "noise" free at the time it is being generated, and meets all specifications for amplitude, frequency, harmonic distortion and others. However, the same specifications cannot be guaranteed at the point of usage, due to the disruptive factors associated with the transmission from generator to consumer.

While the generated power output starts its journey "clean," and free of noise, it is "polluted" by radio and TV frequencies, spikes from reactive kickbacks due to switching heavy inductive and capacitive loads in transmission lines, and from other interference.

As a result, critical and sophisticated electronic controls may malfunction; false triggering, user program loss and/or modification may occur and even catastrophic failure.

In view of the problems associated with AC power, it is strongly recommended the source, transmission and final end use be given stringent consideration before any commitment to supply the system is given. Some typical problems in power line usage are:

Blackouts: This is the total loss of power. Generally, they are easy to detect and if a situation arises where they cannot be tolerated then an uninterrupted power supply (UPS) should be used.

Brownouts: This occurs when there is a reduction in line voltage amplitude. If this reduction falls within operating limits, no adverse effects will be experienced. However, if they are frequent and severe, a UPS system should be considered.

Voltage Fluctuations: These are amplitude variations (rapid or slow) and can occur above or below the specified limits. Overvoltage conditions may damage equipment if the duration of the voltage condition is lengthy. It may cause disruptions, data loss, and production downtime.

Noise Spikes: Noise spikes and other unwanted signals superimposed on the AC line voltage waveform are the most common problems associated with the distribution of the power from its grid system. The amplitude of these signals can be from several hundred to a few thousand volts and the pulse width from about one to 200 microseconds. Because of their short duration and random occurrences, these harmful signals are difficult to detect.

3.1.4   Dealing with AC Line and Other Electrical Noise

The best option to effectively eliminate or greatly reduce voltage fluctuations, spikes and line noise is through the use of isolation, constant voltage, or power line conditioner transformers.

Isolation transformers are passive devices that do not have DC paths between the circuits they isolate. The transformer provides attenuation to spikes and common mode noise, but has virtually no effect on transverse mode noise and does not provide protection for voltage fluctuations.

Constant voltage transformers are static Ferro-resonant transformers that can accept fluctuating AC voltage input (within a specified range) and maintain a constant voltage output. The transformers provide good attenuation to transverse mode type noise, however, are ineffective for attenuation of common mode type signals.

Power line conditioning transformers provide good line regulation and are effective in providing attenuation to both common and transverse mode types of noise.

All of the mentioned transformer types are available by various manufacturers and they come in different varieties of operating voltages, power ratings, and frequencies.

Make sure that the 110-220VAC Power Source for the Marquee is a clean noise-free power source used for low voltage control systems as described above. It should be isolated from heavy inductive or RF loads such as motors, motor starters, and welding and other RF equipment. Marquee's power source should be either the same as, or of the same quality, as that used to power your PLC.

The power cable and unshielded communication cable must be run in a separate conduit or wiring harness. The shield at both ends should be connected to the Earth Ground Terminals to minimize extraneous electrical noise pick-up.

CAUTION!
Make sure you connect the Earth Ground wire to the Earth Ground Terminal on the Marquee to avoid possible shock.

3.2

Wiring and Connections

This section of the manual provides information about preparing the marquee for operation, such as setting the DIP Switches, connecting power and preparing to interface the Marquee for serial communication.

3.2.1   Accessing Connectors and Switches

The Marquee has an Access/Cover plate on its backside. This is a gasketed cover plate with two sealed grommets for power and communication cables. The gasket and the grommet seal must be intact to retain NEMA 12 rating. Once you remove the cover plate by removing the four access screws on the plate, you have access to wiring terminals and an 8-position DIP switch for marquee parameter selection.

Power connections

RS-232 connections

DIP Switch **(SW1)** Factory Set: **DO NOT TOUCH!**

DIP Switch **(SW2)**

RS-422/485 Port

Ethernet Port
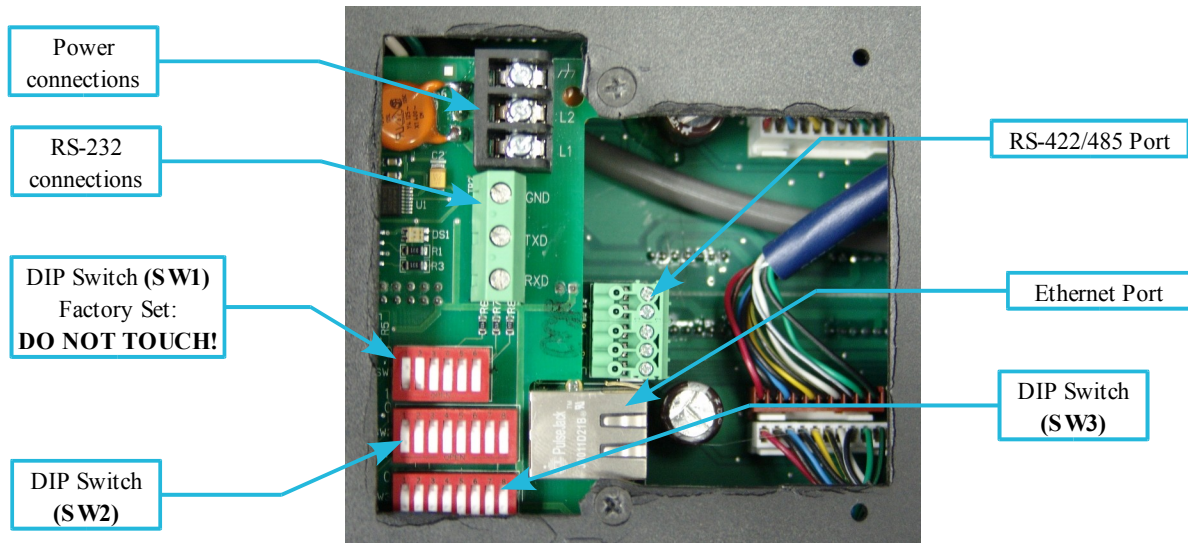
DIP Switch **(SW3)**

3.2.2 Setting Up DIP Switches

Group and Unit Number: Each EZ Marquee is assigned a unit address. A unit address is programmed into each message to specify which unit or units should display that message. The unit address of an EZ Marquee is defined by the setting of the Dip Switch located inside the back panel under the access plate. This can be changed at any time to alter the address of the unit. Each unit address consists of two identifiers—a Group and a Unit Number. The unit addresses are divided into Group and Unit Numbers to allow the message controller address selected subsets of all the Marquee displays connected to it.

NOTE: The Unit Number and Group Number selection is applicable only if you use either the RS422/485 port of the marquee or connect the marquee using Ethernet, DeviceNet, or Profibus options.

CAUTION!

Please DO NOT TOUCH SW1 (the 5-position DIP switch above the 8-position DIP switches)! SW1 is for factory use only!

3.2.3 Setting up DIP Switch 1
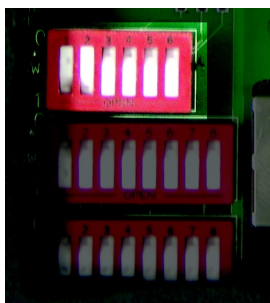
DIP Switch 1 is preset from the factory;

DO NOT touch DIP Switch 1 under any circumstances!

3.2.4   Setting Up DIP Switch 2

The diagram below illustrates how to set up DIP Switch 2:

Unit Selector

Switches			Unit
5	4	3	Number
0	0	0	1
0	0	1	2
0	1	0	3
0	1	1	4
1	0	0	5
1	0	1	6
1	1	0	7
1	1	1	8

Baud Rate

Switch 1	Baud
0 =	9600
1 =	38.4K

Character Set

Switches			Char.
8	7	6	Set
0	0	0	U.S.
0	0	1	Cyrillic
0	1	0	French
0	1	1	German
1	0	0	English
1	0	1	Danish
1	1	0	Swedish
1	1	1	Kana

Group Selector

Switch 2	Group #
0 =	1
1 =	2

Open = OFF = 0
Closed = ON = 1
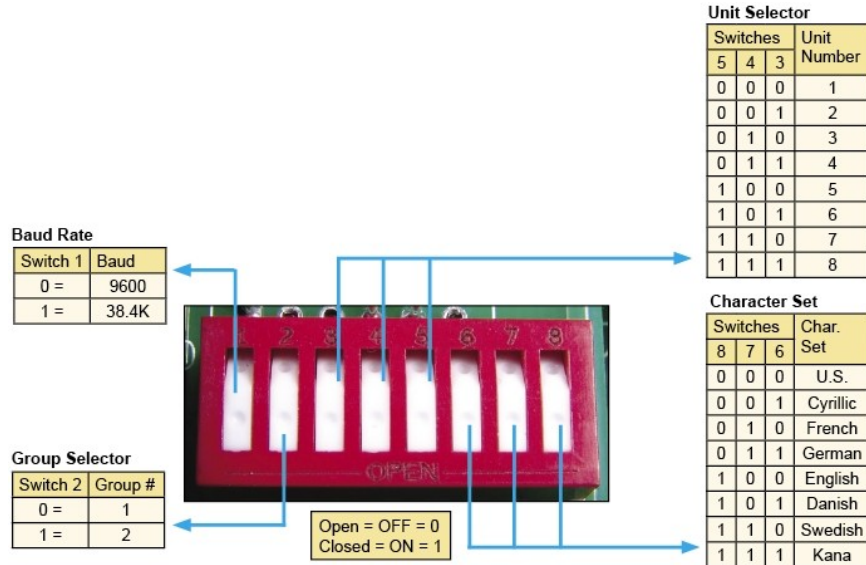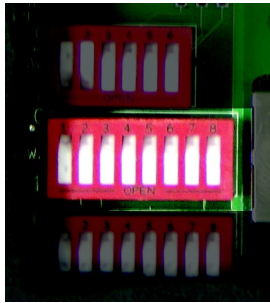
3.2.5   Setting Up DIP Switch 3

The diagram below illustrates how to set up DIP Switch 3:

Default Character Size

SW2	SW3	Default
1	1	0 = 8 inch
0	1	1 = 6 inch
1	0	2 = 4 inch
0	0	3 = 2 inch

PMD/ASCII Protocol

Default	SW1
0 = PMD	1 = PMD
1 = ASCII	0 = ASCII

Not Used

Open = OFF = 0
Closed = ON = 1
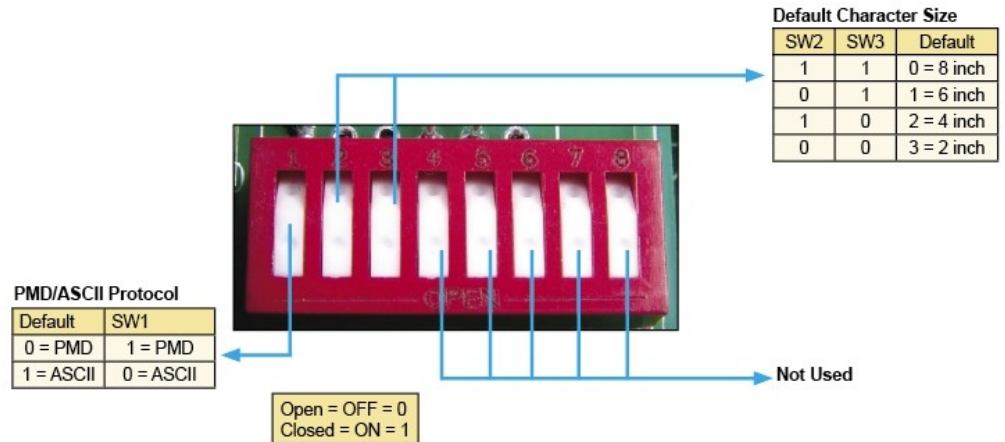
3.3   Serial Communications Ports

3.3.1   Connect to PC

Connect your PC's serial port to the RS232 port using the programming cable.
1. Connect the 9-pin terminal of the RS-232 cable to the computer.
2. Wire the other three flying ends of the RS-232 cable to the ToughMarquee as shown in the figure below:

PC COM Port

Pin	Function
5	GND
3	TXD
2	RXD

ToughMarquee RS-232 Terminals

GND
TXD
RXD

Shield connected to
Earth Ground on both Sides
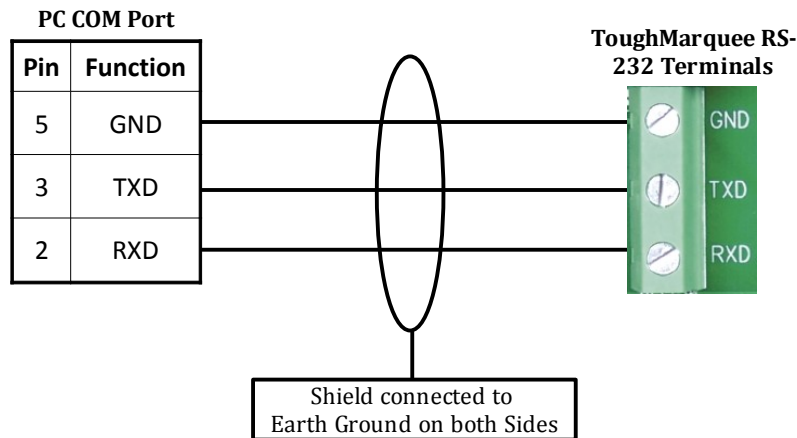
3.3.2   Wiring RS-422 to the Marquee

The Marquee's RS422 port can be used to network up to 16 marquees on a single RS422 network. In order to use RS422 port for communicating with a PC, use an appropriate RS232 to RS422 Converter on PC side.

The following diagram illustrates the required connections for linking multiple or single displays.

Message Controller

SD-
SD+
RD+
RD-
GND

Marquee RS-422 Terminal Block

SD-
SD+
RD+
RD-
GND
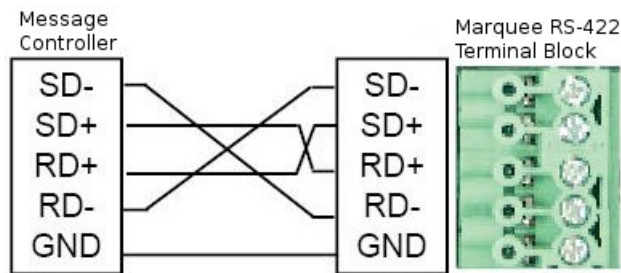
3.3.3   Connecting the Marquee over Ethernet

The Marquee's Ethernet-enabled models are rated to handle 10/100 Base-T speed with single drops that can be up to 100 meters. The maximum number of Marquees connected on Ethernet is network dependent as every Marquee will have its independent IP Address along with group and unit number.

Hub

Message Controller with Ethernet

RJ-45

CAT 5 (Patch)

RJ-45

ToughMarquee

RJ-45

ToughMarquee 1, 2, or 4 Lines

Ethernet Jack on Marquee
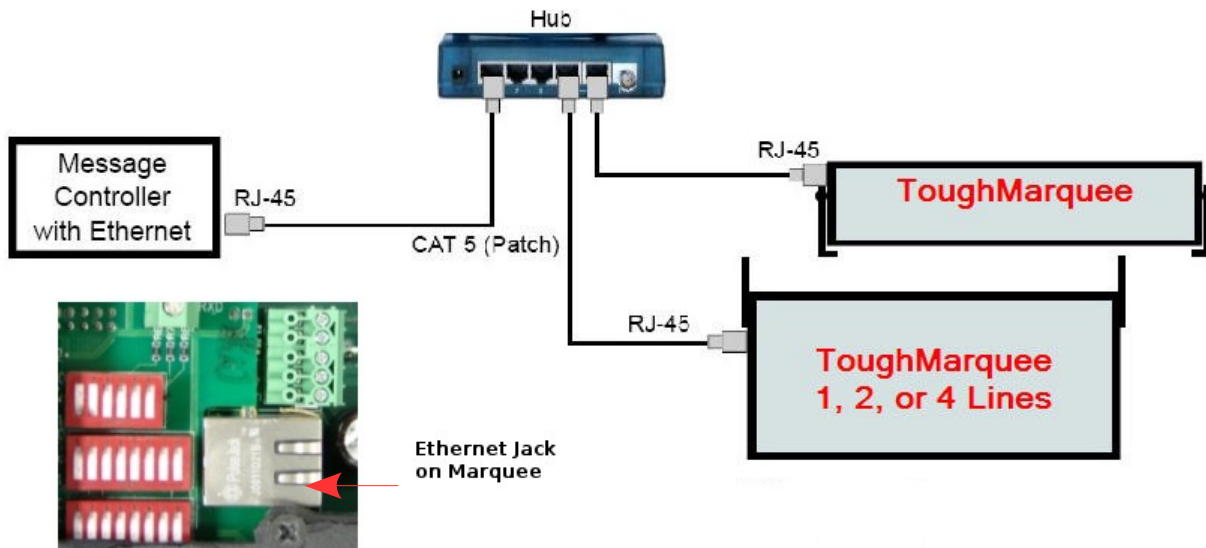
3.3.4   DeviceNet Connections

DeviceNet Scanner

ToughMarquee

ToughMarquee 1, 2, or 4 lines

Pin 1

Terminal Block connector

Socket on PCB
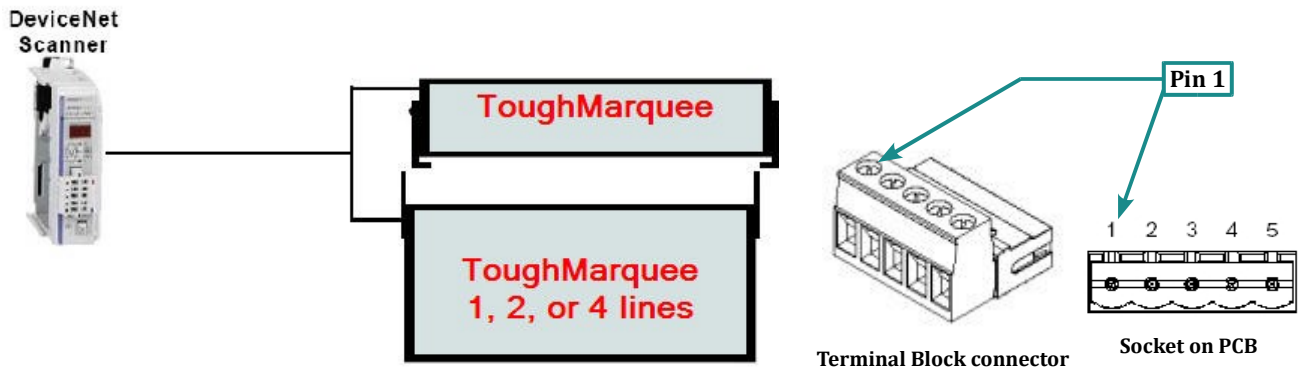
Connector Pin	Signal	Description
1	V-	Negative Supply Voltage
2	CAN_L	CAN_L bus line
3	SHIELD	Cable shield

Profibus Master

Serial PROFIBUS DP Master Art. No.: 1258

3.3.5

ToughMarquee

ToughMarquee

Profibus Connector
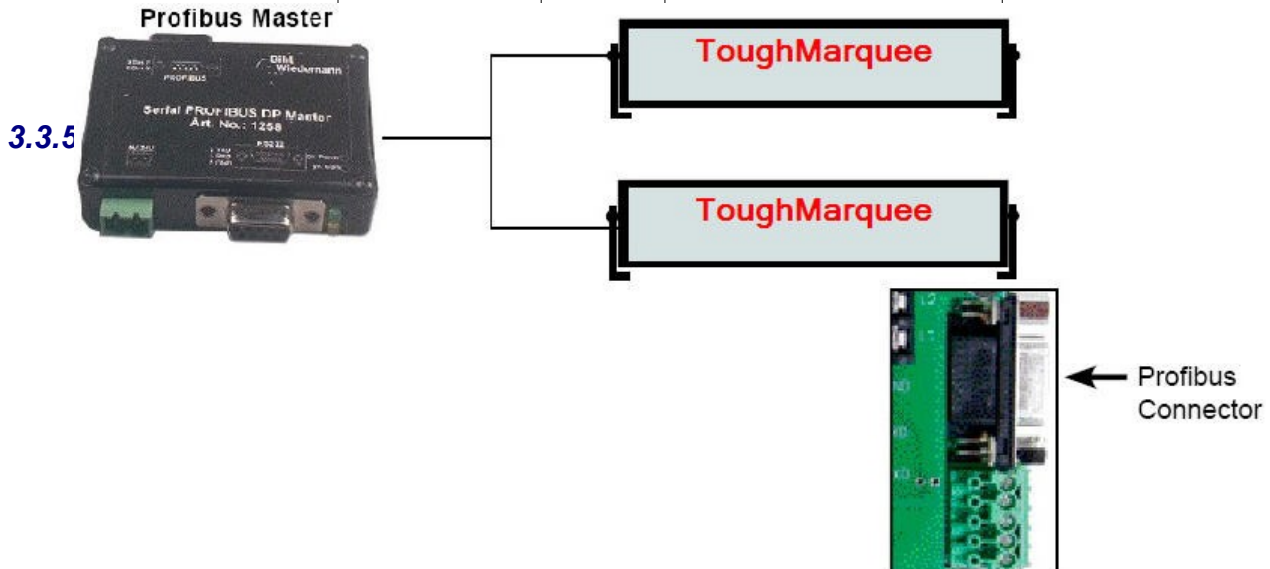
:::Serial Conection to PLC? [Not in this section of the EZ Marquee manual]:::

3.4 Connect to Power

The Marquee's power input is 110-220VAC @ 50-60Hz. Three terminals are provided for connecting operating power to the unit. These terminals are located on the Control Board (see the figure below).

Power Input terminals are labeled L1, L2, and chassis ground (8). Always connect the ground terminal to the safety ground.
Connect the unterminated end of the AC Power Cord to L1, L2, and GND (Black or Brown to L1, White or Blue to L2, Green or Green w. Yellow stripe to GND).

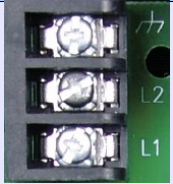| Terminal Block	Pin	Lead	Wire *(US)*	Wire *(European)*
	8	(GND)	Green	Green/Yellow stripe
	L1	Load	Black	Brown
	L2	Neutral	White	Blue

3.5 Mounting Overview

The ToughMarquee is a panel-mount unit. All units use DIN Clips for mounting to cabinet after cutting out the panel. No through-holes are needed. The diagrams in this chapter provide all the diagrams and dimensions you will need for each model to prepare an enclosure surface prior to mounting the ToughMarquee using the enclosed DIN Clip hardware.

CAUTION!
To ensure proper cooling of the ToughMarquee:
- **Mount on a VERTICAL SURFACE ONLY**
- **Allow 1-inch clearance between rear of panel and enclosure**
- **Allow 4-inches for panel X-Y clearance**

ToughMarquee models are mounted using several different methods, depending on the size,weight, and material of the unit. Due to their size, and the need for visibility, most will be suspended from above. But smaller units can be mounted onto a surface. A variety of suspension rigs and mounting brackets are available with the units.

:::Need info & illustrations. I really do not know which of the following three categories applies to which units, other than a relatively vague idea concerning the aluminum units. For example: Do the 1L20C &/or the 2L10C really need to be suspended? They have welded housings, but their dimensions and weights are comparable to the smaller aluminum units that would/could be surface mounted. :::

3.5.1   Suspension Mounting

3.5.2   Wall Mounting

3.5.3   Surface Mounting

3.6   Dimensional Diagrams: Welded Housing

:::Lacking any proper mechanical drawings, I opted for what I hope is a simple guideline that is (somewhat) proportional, and inclusive of all the different models. If we need individual drawings for each unit, I really think they should be done properly. If we're ordering the housings, we must have AutoCAD drawings that we're sending to the machinists. These can and should be adapted for installation information.:::

Welded Steel Housing Dimensions (all have a depth of 4¼ inches)

150"

80 Characters of Text

76"

40 Characters of Text

40"

20 Characters of Text

20"

10 Characters of Text

All welded steel housings have a depth of 4.25"

8 Lines of Text

4 Lines of Text

2 Lines of Text

1 Line of Text

ASCII TEXT 212

4"   6.25"   11.5"   16.3"   25.9"
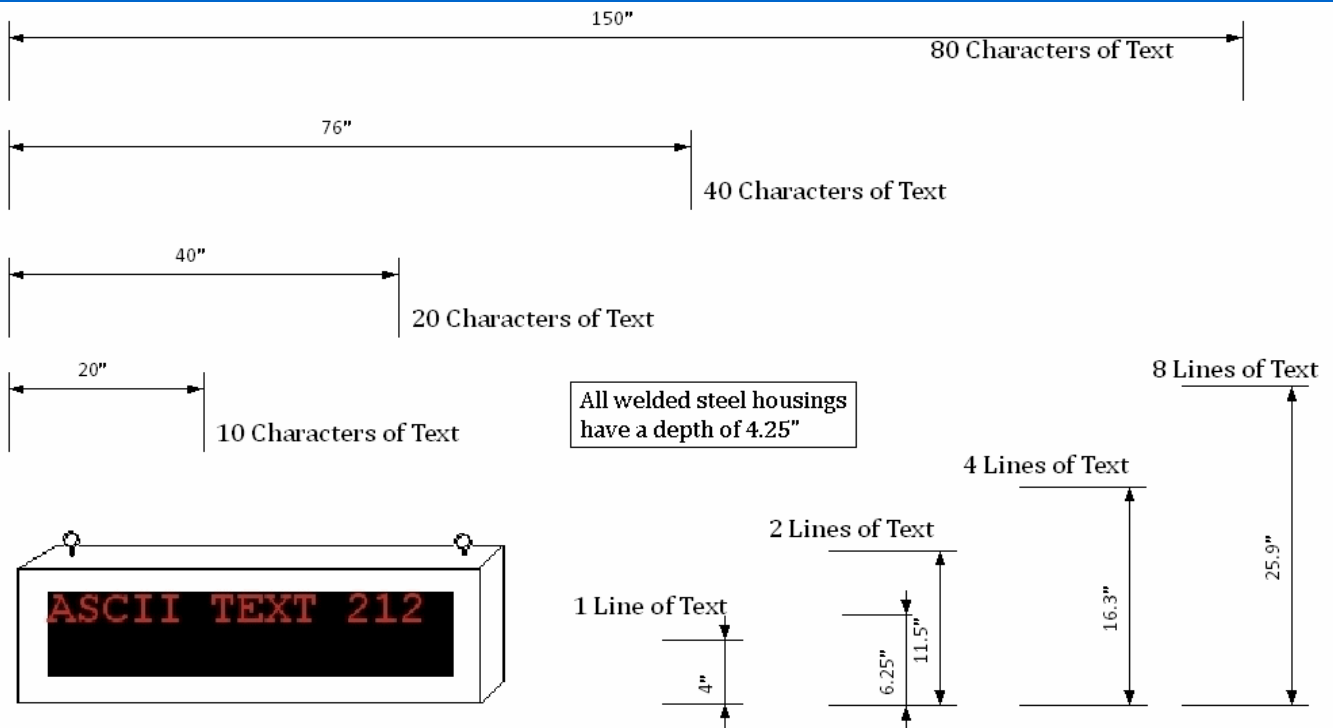
Again, the size determines the model number, and both are representative of the selection of the number of text lines and the number of characters per line (using the smallest character set – 2" – as a base). Thus:

of <u>L</u>ines of Text · # of <u>C</u>haracters;

Unit # 4<u>L</u>20<u>C</u> =

4 lines of 2" Text

x20 characters per line
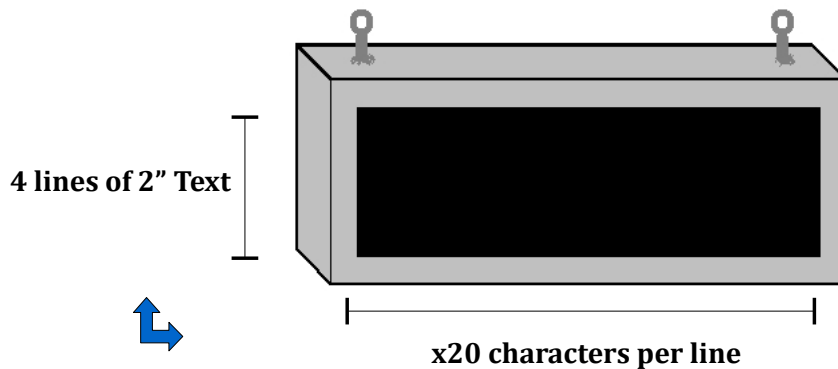
3.7   Dimensional Diagrams: Aluminum Extrusion

3.7.1   2L20C

3.7.2   4L20C

3.7.3   2L40C

3.7.4   4L40C

CHAPTER 4: TOUGH SMARTMARQUEE UNIT

4.1 Introduction

The ToughSmartMarquee product line adds the following features to our popular PMD 3000 series of marquees:
- A simple to use windows based program with export/import features.
- Making application of marquees yet easier by adding the ability to display messages without touching PLC program.
- Flexible data embedding in messages by allowing you to embed any random registers in the messages.
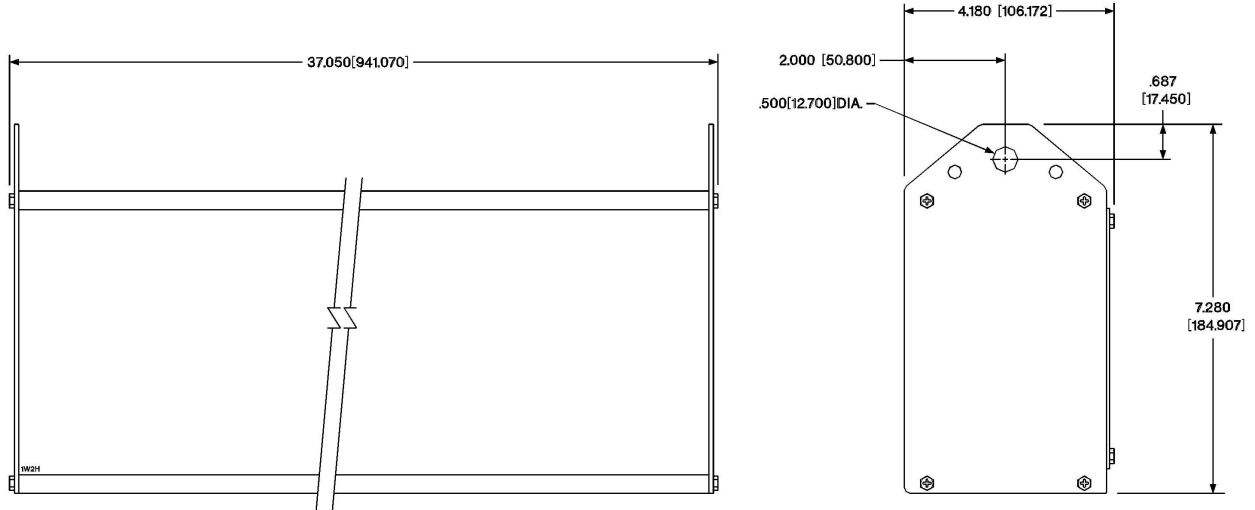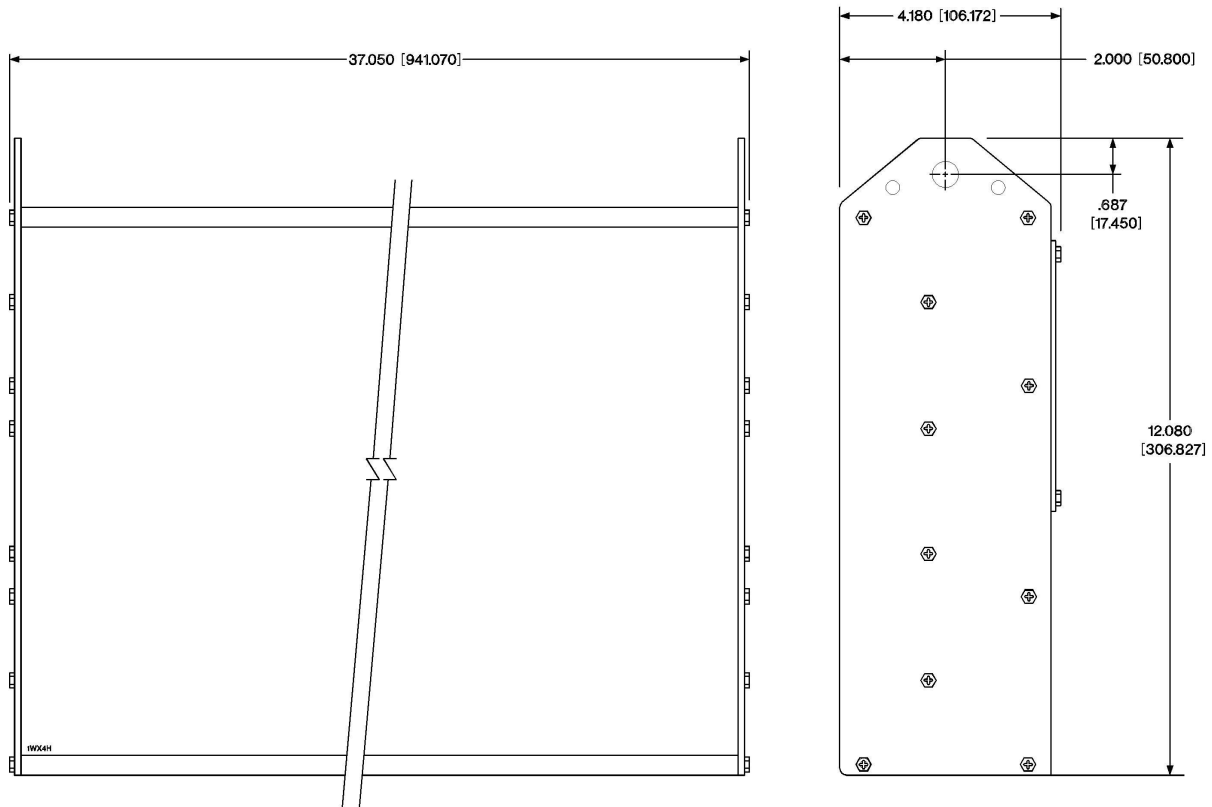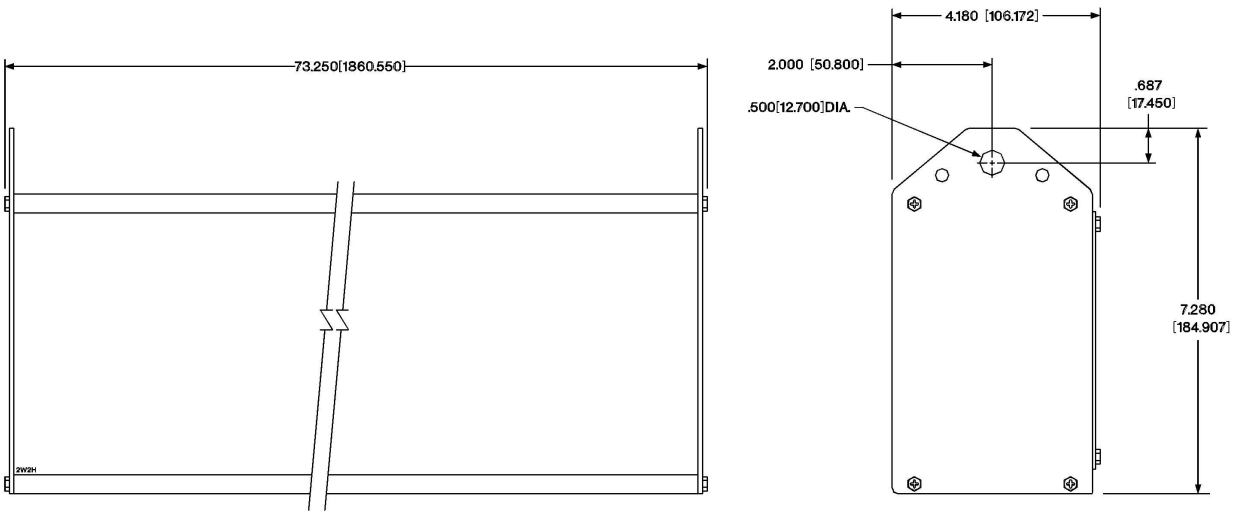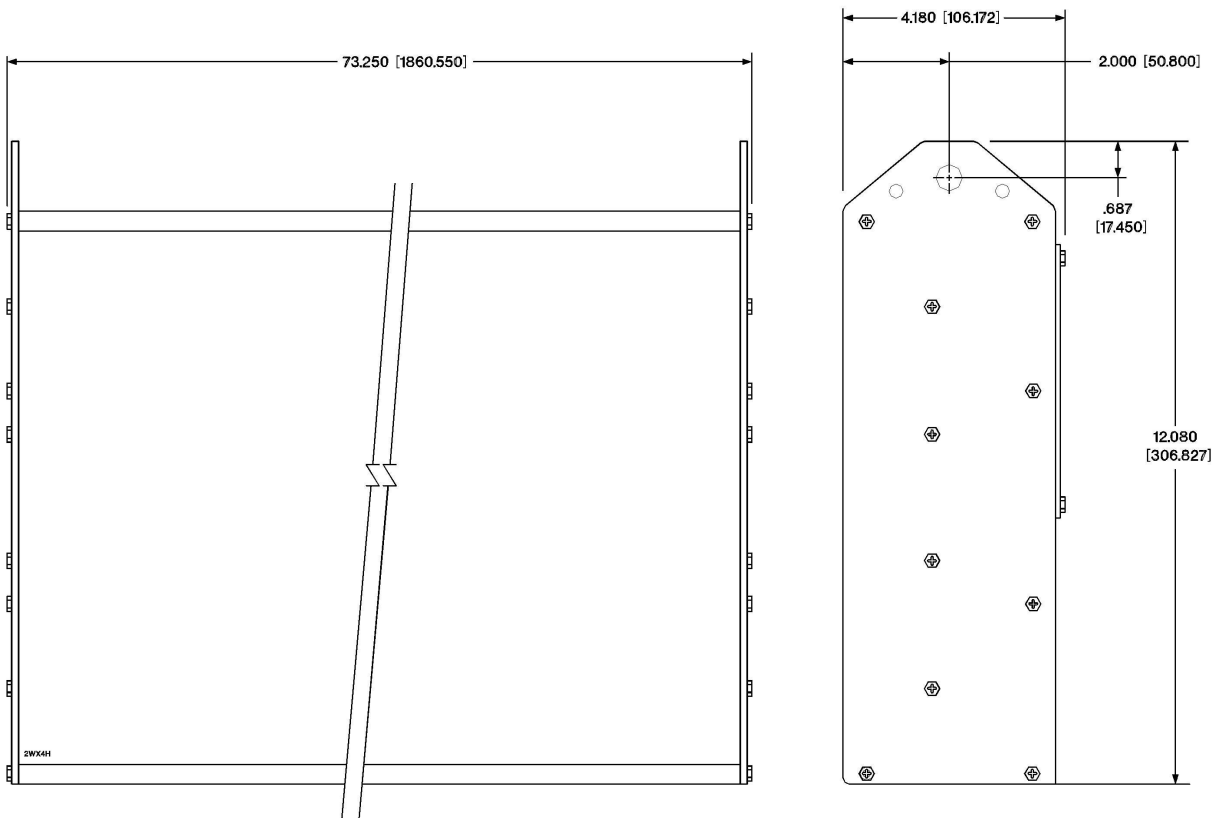- Use Internet/Intranet to View and Control messages

Tough SmartMarquee now allows you to add a display to communicate Machine/Process status and alarms to plant floor without having to make any changes to the PLC program (as long as the data is available in PLC).

4.2 Master & Slave

4.2.1 The Master Marquee

A Master Marquee is alphanumeric and stores up to 175, 80-character messages per 16K of memory. These messages and their characteristics (such as blinking, centering, scrolling, etc.) are programmed using a programming software (runs on a PC) available from AVG Uticor. A Master Marquee continuously polls the connected PLC for a message number and several control parameters (may or may not be programmable in some cases). Based on the control parameters, the Master Marquee can display the message, send the message to one or a group of Slave displays (described below), or it can broadcast the message over Uticor Slave Network. A PC can also control the Master Marquee. Master Marquees come in two configurations, Red LED (PMD 3000 Series) and Tricolor LED (PMD 3600 Series).

4.2.2 The Slave Marquee

Slave Marquees do not store messages. They are typically used with a Master Marquee, Master Message Display, Message Controller or a Touchscreen Programmable Graphical Interface. A Master Marquee, Master Message Display, Message Controller, or Touchscreen Programmable Graphical Interface can drive a network of several Slaves. Each Slave used on a network has a unique address. Addressing scheme allows a message to be sent to one, several, or all Slaves on the network. Slave Marquees include PMD 1100, PMD 1200, and PMD 1205.

4.3 The SmartMarquee

As a Master Marquee control unit, the SmartMarquee has programmable control functionality and increased communications expandability beyond that of the standard Marquee. In this respect, the ToughSmartMarquee is a level above other UTICOR marquees or displays in that, being a Marquee display with an HMI processor added to it, it allows you to program the SmartMarquee similarly to an HMI panel. It is thus basically two units in one housing -- a message display and an HMI control unit. Once programmed using the ToughSmartMarquee Programming Software, you can send to and receive data from other marquees or various devices through a programmable logic controller (PLC). You will still

send messages to the SmartMarquee Master's display just as you would a slave unit.

Tough SmartMarquee has 3 types of messages:

4.3.1 Priority Message

Tough SmartMarquee allows you to program a (single) Priority Message along with a condition (such as Bit is set, a register is beyond a value or outside a range, etc). Tough SmartMarquee would continuously monitor the programmed variable, and display this message when the condition is met. No other message is displayed when priority message is displayed, so this is used for only critical messages.

4.3.2 Status & Alarm Messages

The second type of messages are Machine/Process Status & alarm messages. Like the priority message, user needs to program message display conditions. You can program any number of such messages. If multiple messages need to be displayed, Tough SmartMarquee would cycle through these messages.

4.3.3 Normal Messages

The normal messages are programmed along with a message number, and which of the programmed message needs be displayed is controlled by the PLC. Only for this type of message, you will have to provide logic in the PLC. The Priority and Status/Alarm messages DO NOT NEED to do anything with the PLC program.

4.4 Databases

4.4.1 Message Database

With the SmartMarquee, messages displayed can be Stationary, Scrolling or Blinking based on the embedded codes in an ASCII string. These messages along with their display characteristics are stored inside the SmartMarquee. The number of messages stored are practically unlimited. Messages can be imported from and exported to an Excel spread sheet, or as a CSV file.

4.4.2 Alarms & Alarm Database

The SmartMarquees offer a sophisticated Alarm system. It allows you to monitor events (bits), and values (registers). The values can be monitored for a variety of conditions (=, >, <, in/out of range). The alarms can be selectively displayed, printed and/or logged. The alarms are also stored in a separate alarm database which can also be imported from or exported to an Excel spread sheet, or as a CSV file.

4.5 Processor Functions

4.5.1 Math-logic/Multi-function Buttons, Overlapping Objects

Master SmartMarquees offer a sophisticated control, called the Multi-function Object. As the name implies, this Object allows you to perform multiple functions, including Mathematical and Logical operations on PLC data. For example, you can set/reset multiple bits & transfer constants or variables or expressions to tags. Remarkably, this Benefit allows a user to perform up to 20 operations with one

Object. Master SmartMarquee also allows you to perform these Multiple functions under the PLC control; a very useful feature to offload mathematical & logical computations from the ladder logic to the Marquee.

4.5.2   Remote View and Control

Tough SmartMarquees have an exclusive unique feature that allows you to view and control the contents of your SmartMarquee including any PLC tags - and, of course, messages - over the Internet. View and control Marquee messages over the Internet from your PC as if your PC was directly connected to the Marquee on the factory floor. This is also a great tool for management/quality personnel in any plant to monitor production over intranet.

With this Unique Innovative feature you can get as creative as you want. You can for example:
- Convey work schedules
- Send operator instructions
- Monitor production data
- Monitor quality data
- Send congratulatory messages

4.6   Extended Communications

4.6.1   Modbus Plus

4.6.2   CC Link

4.6.3   DH+ and Remote I/O

CHAPTER 5: ASCII INSTRUCTIONS AND SOFTWARE

5.1   Introduction to ASCII Protocol

ToughMarquee's ASCII protocol transmits information using ASCII characters only and uses ASCII control codes. Using this ASCII protocol, an intelligent device like a computer, a controller, or a PLC can formulate messages and their appearance (scrolling, blinking, character size, color, etc.) to display on a ToughMarquee.

When a message comprising of ASCII commands is sent to a ToughMarquee, it is displayed only if interpreted properly. If the message sent does not comply with ToughMarquee's ASCII protocol, ToughMarquee might not react properly. Also, ASCII commands sent to ToughMarquee are case sensitive. There is no handshaking with a master device. Therefore, it is recommended that you take advantage of our ToughMarquee Software Utility for creating ASCII strings with proper ASCII commands. Once you are done creating ASCII strings through the String Generator software, you can paste the created ASCII strings in PLC instructions or any other intelligent device that you might be using RS-232, RS-422/485 to send messages to the ToughMarquee.

All ToughMarquees have two built-in communication ports (RS232 and RS422/485) both of which can be used to receive ASCII command strings. ToughMarquees can ONLY interpret messages sent in ASCII format. Therefore, it is important to understand how ToughMarquee interprets ASCII strings. This chapter will describe in detail how to formulate messages using ASCII protocol that can be sent to a ToughMarquee.

Note: It is recommended that you take advantage of our ToughMarquee Software Utility for creating ASCII strings with proper ASCII commands.

5.2   ToughMarquee Software

ToughMarquee Software for ToughMarquee is an available tool which can be utilized to generate messages in ASCII protocol along with the necessary commands. The software is easy to use and will allow you to create messages (along with the information needed for scrolling, blinking etc) without knowing anything specific about ASCII protocol. If you are not familiar with ToughMarquee ASCII protocol, we recommend that you take advantage of this tool. The ToughMarquee software is available as a download from the Uticor website www.uticor.net
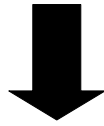
The ToughMarquee software can be used to configure a ToughMarquee, preview messages, and generate ASCII strings. These strings can be simply copied and pasted in any PLC'S ladder logic or any other intelligent device being used to send messages to your ToughMarquee. Once you've downloaded the ToughMarquee Software, perform the following Three Simple Steps to configure your ToughMarquee:

1. Configure ToughMarquee to Set Up Communication Parameters along with Group and Unit Number if a network of marquees is present.

2. Type in Your Message along with its attributes (character size, color, and effects like scrolling or blinking).

3. Preview the Message to make sure it appears as you want it to and then just copy the generated ASCII string using the Windows copy feature and paste the string into your desired controller's logic.

The ToughMarquee software can also be used for testing ToughMarquees. Just simply connect a ToughMarquee to your computer's serial port (See Chapter 3 for wiring details) and you will be directly connected to the ToughMarquee for sending messages.

5.3   Simple Steps to Get Familiar with ToughMarquee

Step 1:

*Set Up
Communications
Parameters*

Step 2:

Type In Your Message

Step 3:

Preview the Message
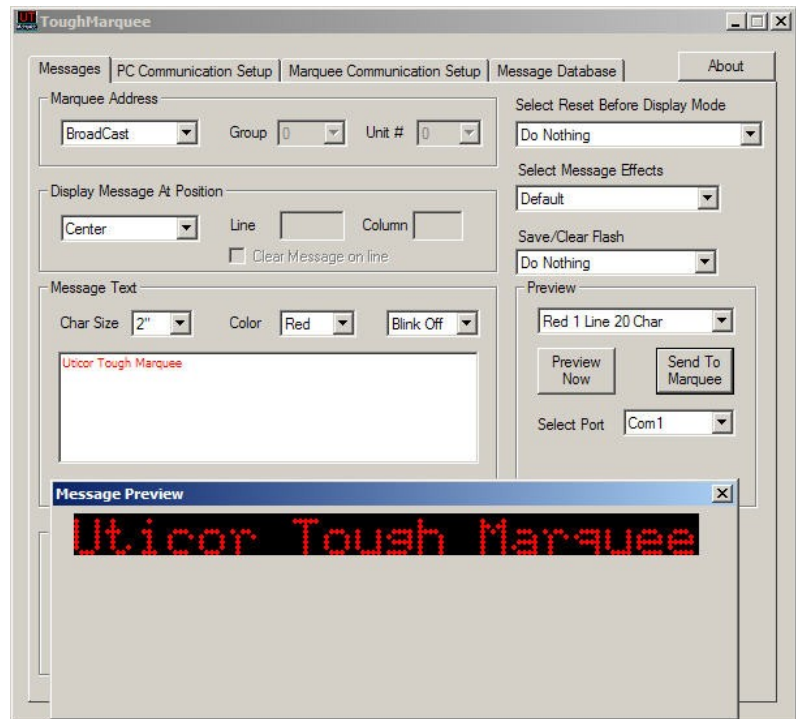
5.4   e Software to Configure ToughMarquee

To configure your ToughMarquee using the ToughMarquee Software, perform the following 3 Simple Steps:

1. Configure ToughMarquee to set up communication parameters and addresses if it is in a network of marquees.
2. Type in your message along with its attributes like character size, color, and effects like scrolling or blinking. Preview the message to edit any changes.
3. Copy the ASCII string and paste to the appropriate line in your ladder logic.
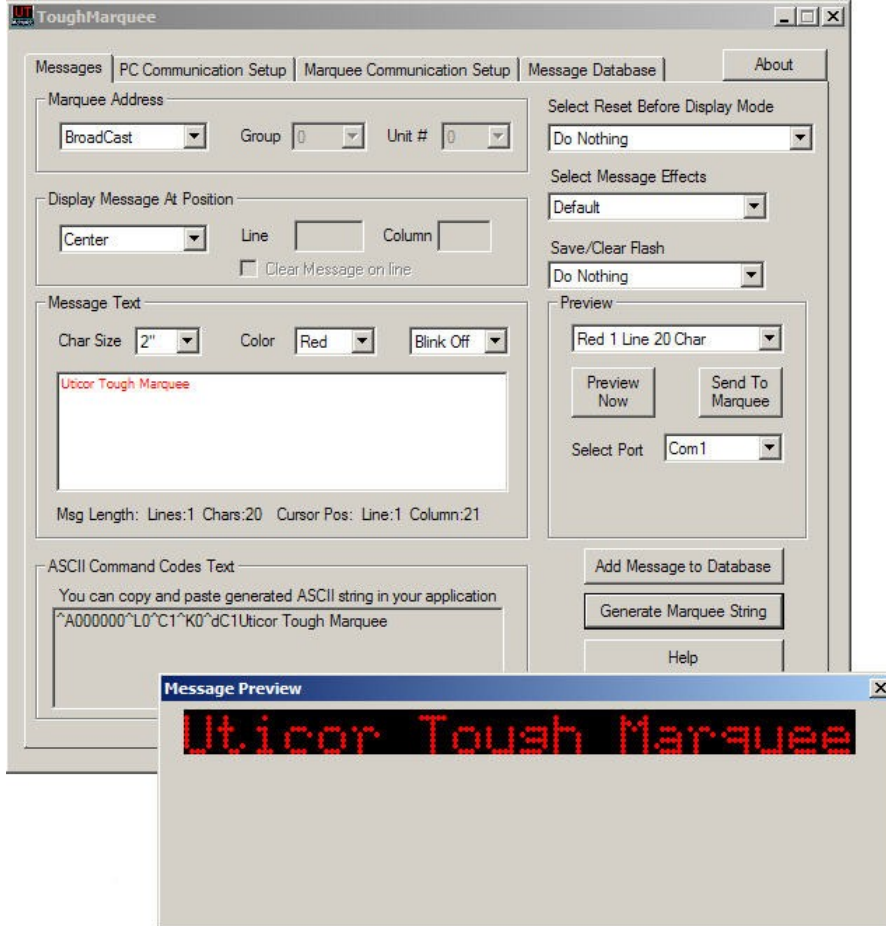
We make it EASY to generate ASCII Strings

The Message Preview window shows you instantly how your message will look

5.5   Cursor Positioning For Messages

Before we introduce the ToughMarquee's ASCII command set, it is important to understand how the positioning of messages works. Understanding this properly will allow proper operation and positioning of messages on a ToughMarquee.

Let's take the example of a 2 Line, 20 characters per line ToughMarquee (model# TSM-2L-20C). This ToughMarquee is capable of displaying 20, 2-inch (2") characters per line max and has 2 lines total. If we send a message "Oven Temp: 189F" to this marquee, in its default mode after power-up, it will show as follows:

Now if we send another message "212" without specifying cursor position (ASCII Command: ^Mrrcc; will be described in detail later in this section), it will be displayed as follows:

Now if we take a step back and send the message with cursor positioning command; we can display the message "212" as follows:

Or we can display another message "Temp Over Shoot" on the next line using 'Select New Line' (ASCII Command: ^In) as follows:

Whenever a character is sent to ToughMarquee it is written to the current "cursor position", which is the very next character space on a ToughMarquee after a message is displayed, unless specified by an ASCII command to do otherwise. Once a new character is sent to ToughMarquee, the current "cursor position" is advanced. All subsequent characters are written on the right side after each other unless specified otherwise via an ASCII command.

There are many ASCII commands to position the cursor properly, which will be described in the next section in detail, including "Reset Display, Position Cursor, Select New Line, Select Wrap, Select Number of sticks per line, and Position Cursor without Clearing the Line".

5.6   Valid ASCII Commands Accepted by ToughMarquee

Valid ASCII Commands	
^Agguuuu	Selecting Unit and Group Number
^En	Resetting Display
^Hnncc	Cursor Positioning With Line Clearing
^Mnncc	Cursor Positioning Without Line Clearing
^In	Cursor Positioning at Carriage Return
^Jn	Selecting Text Wrap
^Cn	Selecting Center Mode
^dCc	Selecting Character Color
^Ln	Selecting Number of Sticks per Line*
^Kn	Selecting Character Size
^Bn	Selecting Blink mode
^Xn	Selecting Blink Delimiters On/Off

^Gbbcc	Selecting Blink On/Off Rate
^Dn<message text>^N	Displaying Scrolling Text
These, and all ASCII Commands, are Case Sensitive!	

*Note: Selecting Number of Sticks per Line Command – This ASCII command is used to select the number of physical lines (sticks) on a ToughMarquee to be utilized as one display line. This allows you to allocate multiple lines (sticks) to be used as a single line when using 4", 6", 8", and 8" narrow font sizes.

5.7   ASCII Command Interpretation

As mentioned earlier, ToughMarquees only accept ASCII protocol for receiving messages. ASCII protocol consists of ASCII characters only along with ASCII commands which always start with a "^" (circumflex) symbol followed by the command to perform a special function on subsequent messages to be displayed on the ToughMarquee.

Let's take the example of the "Select Unit" ASCII command which has the following syntax:

^Agguuuu

If using multiple ToughMarquees, this ASCII command selects an ToughMarquee based on its assigned Group and Unit Number. In order to get familiarized with ASCII commands it is important to know how these commands are formulated.

^   Lets ToughMarquee look for an ASCII command right after this symbol
A   ASCII command to perform necessary function
gg   User Specified Parameter
uuuu   User Specified Parameter

Thus, when the ASCII String "^A010001HELLO" is sent, the only message that will be displayed by an ToughMarquee with pre-assigned Group Number of "01" and Unit Number of "0001" will be "HELLO". Also note that that the character "A" and the digits "010001" are not displayed because they are part of the ASCII command syntax. For proper formulation of messages to be displayed on a ToughMarquee, it is important to pay attention to the syntax of every ASCII command.

Note: Current ToughMarquee models have only two groups and 8 unit numbers per group. Two digit group numbers and four-digit unit numbers will be available in future expansions.

5.8   Examples

In this section we will provide some examples to get you familiarized with ToughMarquee's ASCII protocol. As mentioned earlier, you can take advantage of our String Generator software available at the Uticor website: **www.uticor.net**.

For simplicity, let's take a 2 Line, 10 characters per line, ToughMarquee. We'll further assume that this ToughMarquee is connected to an intelligent device, e.g. a computer from whence these ASCII strings are being sent.. In the case of a computer, the String Generator Software or Hyper Terminal can be used to send messages. All of the following examples will be based on this size.

1. ^E1Test 123

    On power-up all ToughMarquees assume themselves to be the only ToughMarquee present and automatically process any commands sent to them unless a message is sent with Group and Unit Numbers. When a message with Group and Unit Numbers is sent, a ToughMarquee will only respond to messages which are specifically addressed to it according to its assigned Group and Unit Number.. In this example, "^E1" clears the display, homes the cursor, and resets all parameters modified by ASCII protocol. Once the display is cleared, it will show "Test 123" on the first line of the display.:

2. ^E1^M0201Test 123

    ^E1 will clear the whole display, home the cursor, and reset all the parameters modified by ASCII protocol; and ^M0201 will position the cursor on Line 2 Column 1. "Test123" will appear on the very first column of Line 2.

3. ^A000000^E0^l1^C1This is^NTest Msg

    ^A000000 Selects all the units in every Group (broadcast); **^E0** clears the whole display and homes the cursor; **^l1** sets the cursor to advance to the next line when **^N** (carriage return) is entered; and **^C1** turns the centering mode on for all of the following messages.

    "**This is**" will be centered on line 1 and "**Test Msg**" will be centered on Line 2 of all the ToughMarquees connected on the network.

4. ^A020007^E0Oven: 01^NTemp: 199

    ^A020007 Selects a ToughMarquee with Group #02 and Unit #07; **^E0** clears the display and homes the cursor; and **^N** is carriage return. "**Oven: 01**" will be displayed on line 1 and "**Temp: 199**" will be displayed on Line 2.

Note: Messages that require constant updating of certain segments of a ToughMarquee display can be sent independently by utilizing different ASCII commands as follows:

    ^Mrrcc: Cursor positioning without line clearing

    This command can be used to update/overwrite only a certain segment of the display instead of

resending the same message over and over again. e.g. if you want to update just the temp as displayed in example 4 you could send the following ASCII message:

^M0208200

When the above message is sent, it will overwrite 199 with 200 (present on line=02 and column=08).

CHAPTER 6: CONNECTIVITY TO PLCS

6.1 Connecting ToughMarquee to Different PLCs

Most PLCs have a serial communication port. Based on the type of PLC, it either allows RS232 or RS422/485 type of communication interface. PLCs which have any one of these serial ports and is capable of sending ASCII type messages can be easily used to connect to a ToughMarquee.

ToughMarquees come equipped with two serial communication ports, RS232 port and RS422/485 port. The RS232 port can be used to establish a point-to-point communication interface with a PLC. On the other hand, the RS422/485 port of an ToughMarquee can be used to integrate multiple ToughMarquees on a single network.

The following Chapter will describe in detail how to connect the ToughMarquee to the EZ PLC and other major brand of PLCs, such as Allen-Bradley, Siemens, Mitsubishi, & Direct Logic. For connectivity to Ethernet, DeviceNet, and Profibus, refer to the appropriate section of Chapter 3 (3.3.x), which describes in detail the steps necessary to connect the Marquee to these networks.

6.2 EZ PLC

6.2.1 Integrating ToughMarquee with EZ PLC

As mentioned earlier, a ToughMarquee can be connected to any PLC capable of sending messages over a serial port. However, when using a PLC other than EZPLC, you can use our ToughMarquee software to generate ASCII strings which can be pasted in a PLC's ladder logic. Using this method is fairly simple to implement, but EZPLC has a special "Marquee Instruction" which makes ToughMarquee implementation a lot simpler and faster than any other PLC.

EZPLC's "Marquee Instruction" allows you to create a massage database especially for ToughMarquees. When populating this database, you can specify all the necessary information along with message attributes such as color, character height, flashing, scrolling, etc. without ever having to worry about generating ASCII strings and copying and pasting them in a PLC's ladder logic.

Every EZPLC has an RS422/485 port which can be used to plug-n-play with a ToughMarquee using the extremely simple to use Marquee Instruction. EZPLC's Ethernet-enabled models can also be used to send messages to a ToughMarquee over the corresponding Ethernet port of a ToughMarquee.

6.2.2 Sending Messages to ToughMarquee from EZ PLC

EZPLC has an RS-422/485 port and an Ethernet port that can be connected to the corresponding port on the ToughMarquee. In addition, message programming and storage is much easier as EZPLC has been designed from the ground up to easily communicate with marquees.

To configure and send messages to the ToughMarquee from EZPLC, perform the following 3 Simple Steps:

1. Use EZPLC's "Send to Marquee" instruction to initiate communication with ToughMarquee, and place the instruction.
2. Double click the instruction to bring up the "Send Marquee Instruction" dialog box. Configure your message's source tag and status tag.
3. Control your message attributes without ever having to worry about ASCII format.

Type in your message along with it's attributes like character size, color, and effects such as scrolling or blinking. Preview the message to edit any changes.

Note: These steps are performed using the EZPLC Editor software, not the ToughMarquee Editor software.
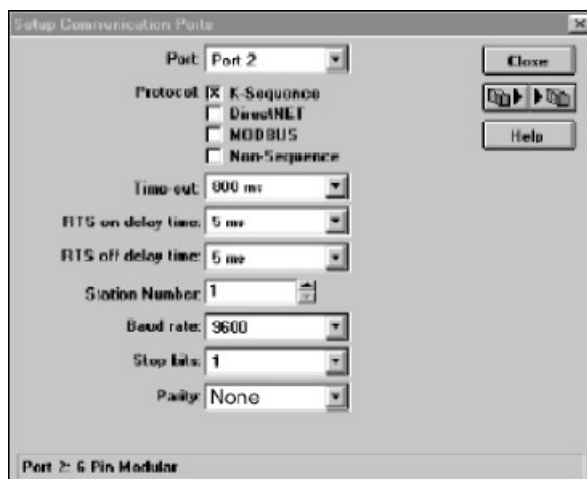
6.3   Communications Parameters

Following are guidelines to connect the Marquee to common PLC brands.
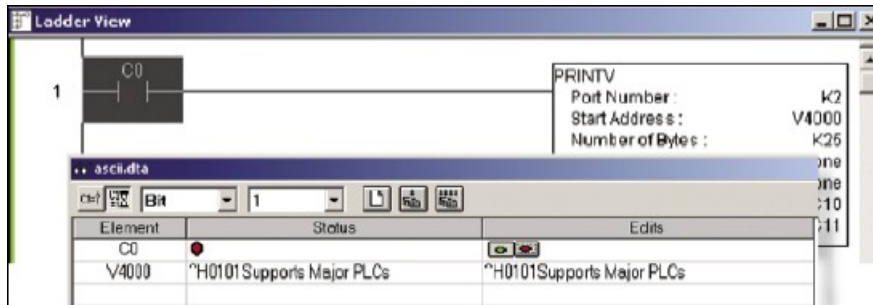
6.3.1   DL06

To connect ToughMarquee to DL06 for Serial Communication perform the following steps in DirectSoft Programming Software:

1. Set up the controller properties for serial communication.

Set up ladder logic and PLC tags. Use the **PRINTV** function to initiate ASCII command to trigger relevant messages.
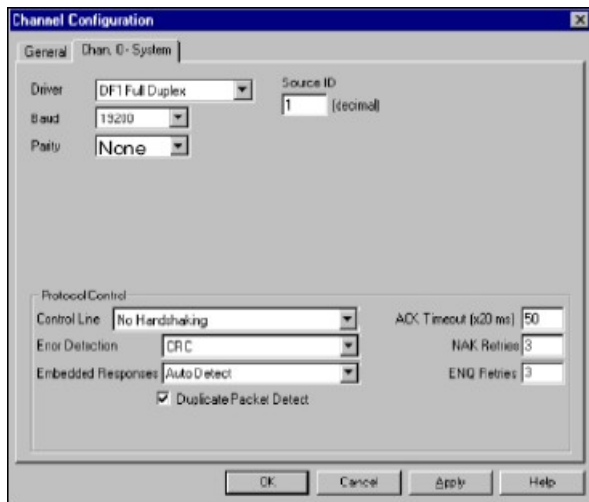
The example below illustrates this:

6.3.2   MicroLogix

To connect ToughMarquee to a MicroLogix PLC, perform the following steps in RSLogix Programming Software:

1. Set up the PLC properties for serial communication as shown below:

2. Create a string (ST) type file to insert ASCII/Hex Commands.

3. Set up ladder logic and PLC tags. Use the AWT ASCII Write function to initiate the ASCII command to trigger relevant messages.

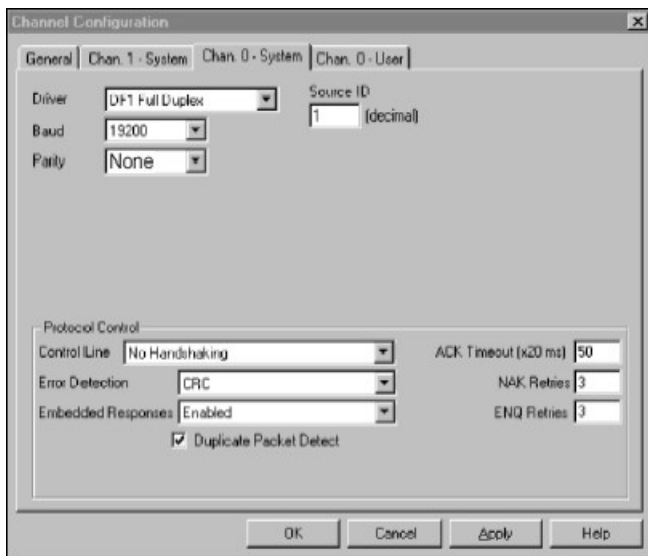***The example below illustrates this:***

NOTE: Must use double backslash - "\\" - before ASCII command character.

6.3.3   SLC5/03, 5/04, or 5/05

To connect ToughMarquee to a SLC 5/03, 5/04, or 5/05 PLC, perform the following steps in the Rockwell Programming Software:

1. Set up the PLC properties for serial communication.

2. Create a string (ST) type file to insert ASCII/Hex Commands.

3. Set up ladder logic and controller tags. Use the AWT ASCII Write function to initiate the ASCII command to trigger relevant messages.
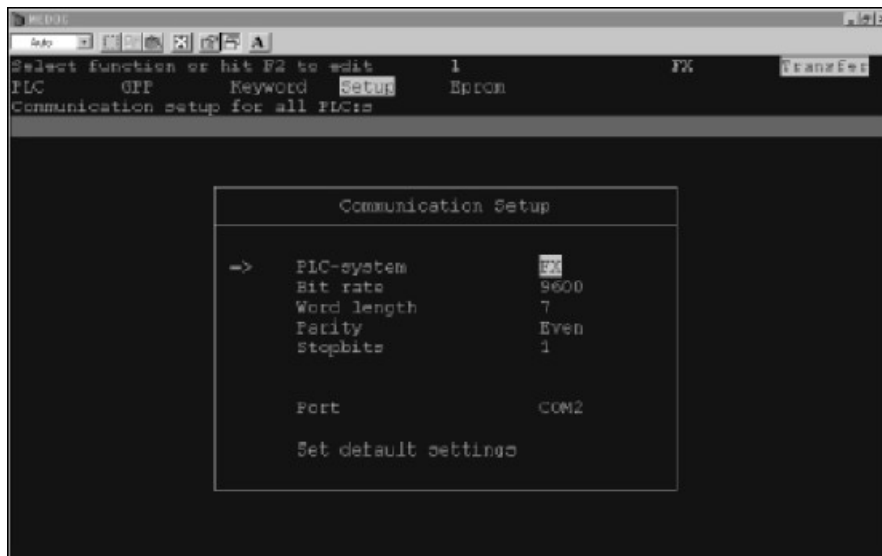
The example below illustrates this:
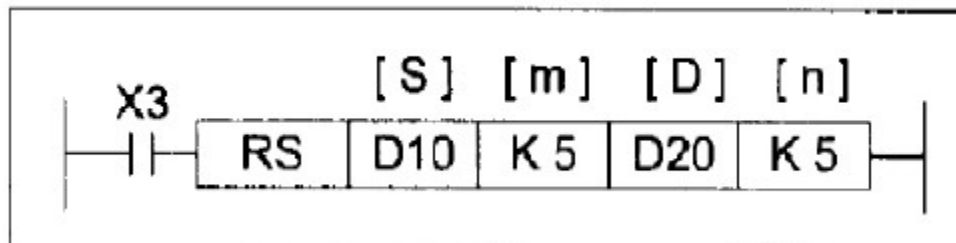
6.3.4   Mitsubishi FX

To connect ToughMarquee to a Mitsubishi FX PLC, perform the following steps in the Mitsubishi Programming Software:

1. Set up the PLC properties for serial communication.

2. Set up ladder logic and controller tags. Use the RS(FNC 80) instruction to initiate the ASCII command to trigger relevant messages.

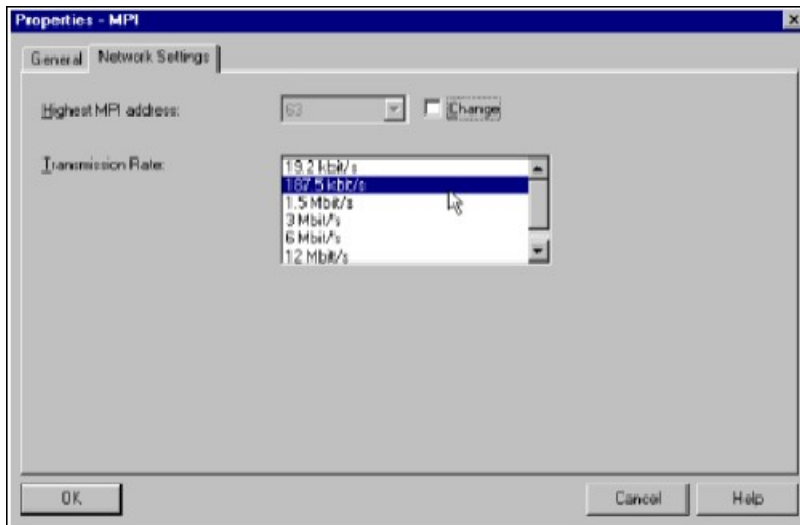*The example below illustrates this:*

6.3.5 Siemens S7

To connect ToughMarquee to a Siemens S7 PLC, perform the following steps in the relevant Siemens Programming Software:

1. Set up the PLC properties for serial communication.

2. Set up ladder logic and controller tags. Use the XMT instruction to initiate the ASCII command to trigger relevant messages.

The example below illustrates this.
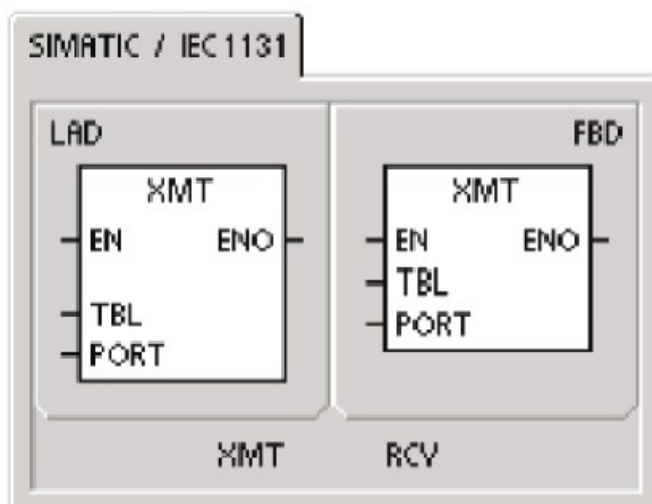
6.4   Other PLCs

The Marquee is designed to work with virtually any PLC or network environment, and we are constantly updating and innovating the Marquee – and all our products – for compatibility and functionality. If your PLC model was not covered in this chapter, we have other resources you can use to set up your Marquee.

If you need further help help with the PLC to ToughMarquee Interface, or any other communications or wiring issue, you can consult the ToughMarquee Software HELP. It has extensive guidelines, by brand, for PLC and Network communication with the Marquee. Also included are instructions and ASCII guidelines for message formatting and syntax. If you are still having difficulty with a particular aspect of installation, setup, or messaging, technical support is available at 1-800-TEC-ENGR (832-3647) or FAX us at 1-563-359-9094. You can also contact technical support through our website at **www.uticor.net**.

CHAPTER 7: CONNECTIVITY TO CONTROL NETWORK

7.1   Ethernet/DeviceNet/Profibus Connectivity

ToughMarquees are available with Ethernet, DeviceNet, and Profibus communication interfaces. These network interface options can be used to connect to a single ToughMarquee or network multiple ToughMarquees on a control network. All these interfaces must be configured before ToughMarquee can be utilized on any of the mentioned control networks.

In order to setup a ToughMarquee for operation on Ethernet, DeviceNet, or Profibus, the user is required to setup parameters like the IP Address for Ethernet, MAC ID for DeviceNet, and Node Address for Profibus. These parameters can be setup automatically by using our ToughMarquee software (available as a download on our website; **www.uticor.net**) or by composing and sending ASCII strings through a utility like HyperTerminal.

All of the settings for a control network operation can only be setup using the serial RS232 or RS422/485 ports and cannot be setup by connecting a ToughMarquee to a control network itself. All of the setup parameters are stored in the non-volatile flash memory of a ToughMarquee and are retained through power cycles and do not require to be re-programmed unless changed you.

7.2   Ethernet

The following section will describe in detail steps necessary for sending messages to a ToughMarquee over Ethernet.

7.2.1   Configuring ToughMarquee for Ethernet Network

When connecting a ToughMarquee to a control network over Ethernet, user is required to setup the following

parameters:
- ◆   IP Address
- ◆   Subnet Mask
- ◆   Gateway

The most convenient way of setting up these parameters for ToughMarquee is to utilize our ToughMarquee software.

Connect a ToughMarquee to your computer using the COM port (refer to **Chapter 3** for wiring diagrams) and perform the steps on the following page.

7.2.2   *ToughMarquee Software*

1. Install ToughMarquee software (available at our website www.uticor.net).
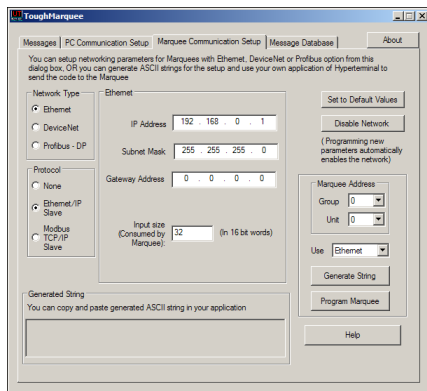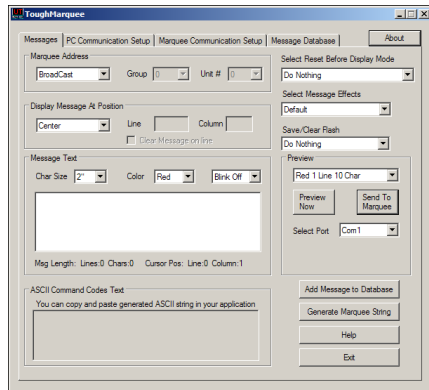
2. Click onto the Marquee Communication Setup Tab.
3. Select Ethernet in Network Type.
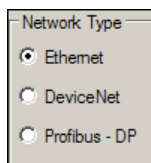
4. Assign an appropriate group and unit number in Marquee Address. This is the address of the marquee being programmed.
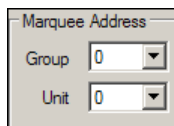
5. Assign proper values to IP Address, Subnet Mask, and Gateway Address.
6. Click onto the Program Marquee button and you're done!
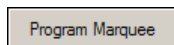
7. You can Disable the network interface by clicking on the "Disable Network" button should you need to do so. Programming new parameters automatically enables the network.

7.2.3 Hyper Terminal

ToughMarquee's Ethernet communication parameters can also be setup by sending ASCII strings through a utility like HyperTerminal. When utilizing Hyper Terminal, ASCII strings must be sent out in the following format:

S. No.	Parameters	Command	Example	Default values (for ^PIL instr)
1	IP Address	^P1Addd.ddd.ddd.ddd	^P1A192.168.000.001	192.168.000.001
2	Subnet Mask	^P1Mddd.ddd.ddd.ddd	^P1M255.255.255.000	255.255.255.000
3	Gateway	^P1Gddd.ddd.ddd.ddd	^P1G192.168.000.100	000.000.000.000
4	Load default	^P1L	Load default parameters (shown in default column)	
5	Disable Network	^P1Z	Disable Ethernet Interface. Programming new parameters would automatically enable the Ethernet interface.	

Use the number of digits shown in the command even if the parameter requires a fewer number of digits. Pad the parameter with leading zeros if necessary.

7.3 Sending Messages to ToughMarquee over Ethernet

Once Ethernet parameters are configured, you can use ToughMarquee software to send messages through Ethernet. You can also use an intelligent device like PLC to send appropriate ASCII messages to the specified IP address of ToughMarquee configured for use on Ethernet.
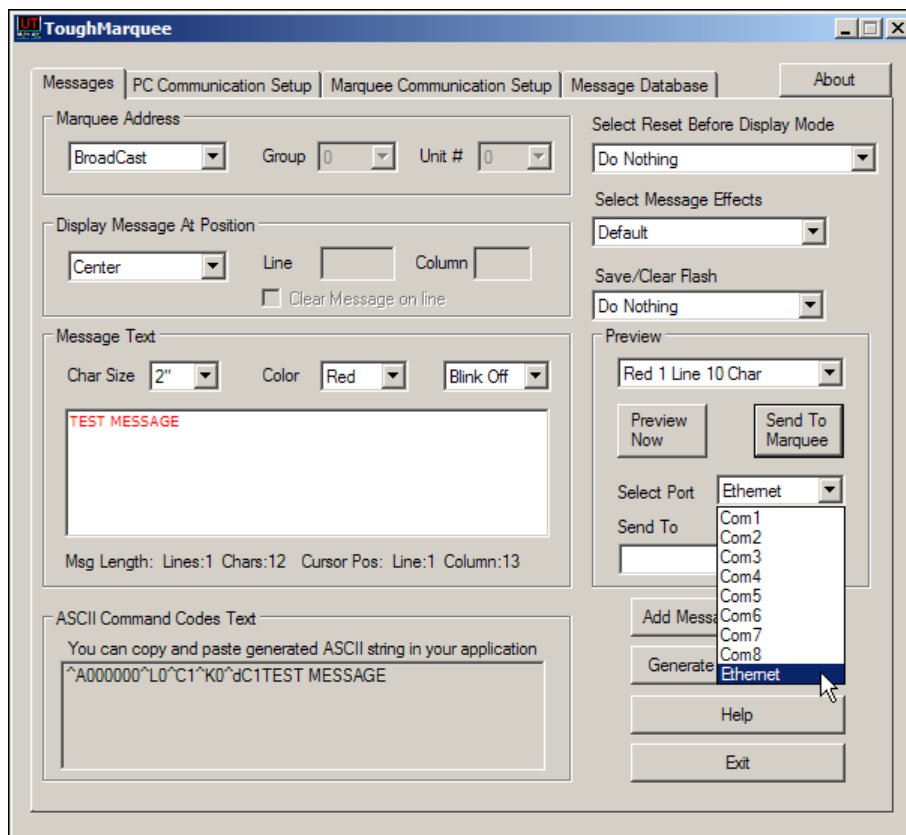
7.4   DeviceNet/Profibus

The following section will describe in detail the steps necessary for sending messages to ToughMarquee over DeviceNet.

7.4.1   Configuring ToughMarquee for DeviceNet/Profibus Network

When connecting a ToughMarquee to a control network over DeviceNet/Profibus, you are required to setup the following parameters:

DeviceNet	Profibus
MAC ID	Node Address
Produced Bytes (Send Bytes)	Output Bytes
Consumed Bytes (Received Bytes)	Input Bytes
Baud Rate	Baud Rate
Byte Order Control	Byte Order Control

The most convenient way of setting up these parameters for ToughMarquee is to utilize our ToughMarquee software.

Connect a ToughMarquee to your computer using the appropriate wiring (refer to section 3.5.1 for wiring diagrams) and perform the following steps:

7.4.2   ToughMarquee Software:

1. Install ToughMarquee software (available at our website www.uticor.net). Click onto the Marquee Communication Setup Tab.
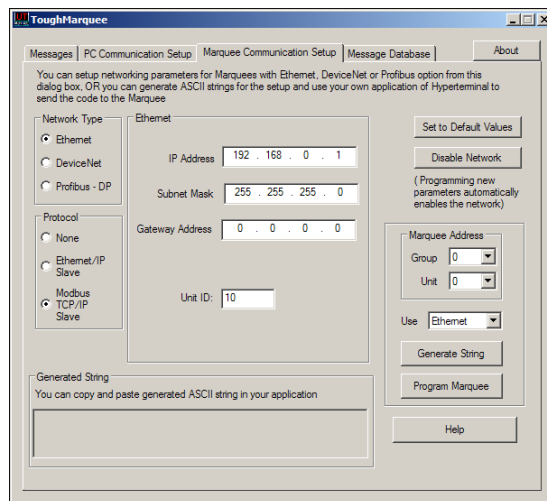
2. Select DeviceNet/Profibus in Network Type.
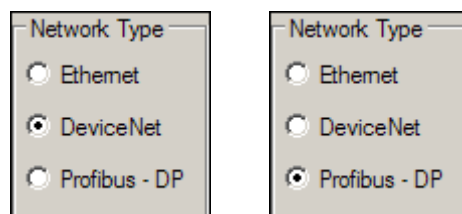
3. Assign an appropriate group and unit number in Marquee Address. This is the address of the

marquee being programmed.

4. Select appropriate parameters for DeviceNet/Profibus.

5. Click the Program Marquee button and you're done!

6. You can disable the network interface by clicking on the "Disable Network" button should you need to do so. Programming a new parameter automatically enables the network.

7.4.3 Hyper Terminal

ToughMarquee's DeviceNet/Profibus communication parameters can also be setup by sending ASCII strings through a utility like HyperTerminal. When utilizing Hyper Terminal, ASCII strings must be sent out in the following format:

DEVICENET

S.No.	Parameters	Command	Example	Default values (for ^P2L)
1	MAC ID	^P2Addd ddd=000 to 063	^P2A020	02D
2	Baud Rate	^P2Bddd ddd=125, 250, or 500 (in KB)	^P2B125	125KB
3	Max Consumed Bytes (receive Bytes)	^P2Rddd	^P2R032	32

4	Load Default	^P2L	Load default parameters (shown in default column)	
5	Disable Network	^P2Z	Disable DeviceNet Interface Programming new parameters would automatically enable the interface	
6	Byte Order Control (See Input area)	^P2Wn N=0,1,2 or 3	^P2W0	0

PROFIBUS

S.No.	Parameters	Command	Example	Default values (for ^P3L)
1	Note Address	^P3Addd ddd=000 - 125	^P3A020	20
2	Baud Rate	^P3B???	^P3B???	12MB
3	Max Input Bytes (receive Bytes)	^P3Rddd	^P3R032	32
4	Load Default	^P3L	Load default parameters (shown in default column)	
5	Disable Network	^P3Z	Disable Profibus Network Interface Programming new parameters would automatically enable the interface	
6	Byte Order Control (See Input area)	^P3Wn N=0,1,2 or 3	^P3W0	0

7.4.4   *Sending Messages to ToughMarquee over DeviceNet/Profibus*

Once DeviceNet/Profibus parameters are configured, you can start sending messages to ToughMarquee by following the instructions described in this section. ToughMarquees are configured to accept up to 120 Bytes from DeviceNet or Profibus networks, and write back 2 bytes to the network.

THE INPUT AREA

Input area (or consumed bytes in DeviceNet) is mapped as follows. The number of bytes in this area is defined by the user by ASCII command ^P2Rnnn (DeviceNet) or ^P3Rnnn (Profibus), where nnn is the number of bytes. Table below assumes that 2N bytes have been allocated for the input area.

Word Offset	Description	
	MS Byte	*LS Byte*
0	Not used	Count Byte
1	Message-Char 1	Message-Char 2
2	Message-Char 3	Message-Char 4
3	Message-Char 5	Message-Char 6
N-1	Message-Char (2N-2)	Message-Char (2N-1)
N	Not used	Controller Status Byte

Example:
If you want to display String "ABCD", and you have defined 8 bytes for the input area, the input area would look like the table below:

Word Offset	Description	
	MS Byte	LS Byte
0	Not used	4
1	A	B
2	C	D
3	Not used	Controller Status Byte

7.5   Byte Order Control

ToughMarquee offers a "Byte Order Control" to work with controllers that may not have the message information arranged as shown in the above table. The command to control the Byte Order is ^P2Wn for DeviceNet and ^P3Wn for Profibus, where n can be 0 (default), 1, 2, or 3. **For most users the default value should work.**
The table below describes byte orders expected for different values of n. The examples after each row show how a count of 2 and message "AB" would be in the bytes.

(Please note that majority of users would not change this from it's default values; Please try the default values before changing byte order.)

n	Numbers (Count & Status)		Characters (Message Bytes)	
	MS Byte	*LS Byte*	*MS Byte*	*LS Byte*
0 Example	High Order Byte 0	Low Order Byte 2	Char 1 A	Char 2 B
1 Example	Low Order Byte 2	High Order Byte 0	Char 1 A	Char 2 B
2 Example	High Order Byte 0	Low Order Byte 2	Char 1 B	Char 1 A
3 Example	Low Order Byte 2	High Order Byte 0	Char 1 B	Char 1 A

CONTROLLER STATUS BYTE:

Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Not used	Not used	Not used	Not used	Not used	Not used	OK to Read	Message Ready

Bit0 and Bit1 of the byte are used for handshaking between the Network and the ToughMarquee, so that the message is reliably sent to the ToughMarquee.

Message-Ready:
This bit is set by controller after the controller has written Count and message bytes. Controller can write these bytes only if the **Busy** and **ACK** bits in output status byte (see below) are cleared.

OK-to-Read:
This bit is set when controller has its **Message-Ready** bit set AND the ToughMarquee's **ACK** bit set to 1.

Count Byte:
This byte contains the number of bytes used message area, i.e. number of characters that the current message has. For example if the current message in the message area is **^A010001Hello** then the count byte will have a value of 13.

7.6   Output Area

The Output Area bytes (Produced bytes in Device Net) are defined as follows:

Word Offset	Status Information	
	MS Byte (Byte 1)	LS Byte (Byte 0)
0	Do not use	Marquee Status Byte

The Byte Order control command controls byte order in input as well as out put area. The mapping above is the default mapping and should work for majority of users. For those users, who need to change this order, please refer to table below which describes the byte order for possible values of n in command ^P2Wn or ^P3Wn:

n	Status	
	MS Byte (Byte 1)	LS Byte (Byte 0)
0 Example	High Order Byte 0	Low Order Byte Status
1 Example	Low Order Byte Status	High Order Byte 0
2 Example	High Order Byte 0	Low Order Byte Status
3 Example	Low Order Byte Status	High Order Byte 0

TOUGHMARQUEE STATUS BYTE

Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Not used	Not used	Not used	Not used	Not used	Not used	Busy	ACKnowledge

Busy:
This bit is set to 1 by the ToughMarquee when it is reading message byte from the Input area. ToughMarquee reads the message (and sets this bit) only after it finds **OK-to-Read** bit set. Controller

must not change the input area when this bit is set to 1. The bit is cleared when the Marquee has finished reading the message.

ACKnowledge:
ToughMarquee sets **ACK** bit to 1 after it detects that the **Message-Ready** bit is set. The bit is cleared when ToughMarquee detects that **OK-to-Read** bit is set.

7.7   Operation Using DeviceNet/Profibus

The bits in two status bytes are used for handshaking between the controller and ToughMarquee. **Busy** and **ACK** bits in the Output (Produced area) are controlled by ToughMarquee and monitored by controller to determine its action. OK-to-read and Message-Ready bits are controlled by the controller, and monitored by the Marquee to determine its next action. Following table shows the status of ToughMarquee bits and Controller required action for proper handshaking.

Step	Monitor Bits		Controller Action Description	Set/Clear bits	
	Busy	ACK		Monitor Busy and ACK bits from Marquee	Message Ready
1	0	0	-Monitor Busy and ACK bits from Marquee -When both are 0, write Count and Message Bytes, and then, set *Message-Ready* Bit to 1 -Wait for Marquee to set ACK bit to 1	0	1
2	0	1	-When ACK bit is set, Set *OK-TO-Read* Bit to 1 -When for Marquee to set *Busy* Bit to 1 and ACK bit to 0	1	1
3	1	0	-When Busy Bit is 1 and ACK bit is 0, clear *Message-Ready* Bit to 0 -Wait for Marquee to clear Busy Bit	0	0
4	0	0	-When *Busy* bit is 0, clear *OK-To-Read bit* -Go to Step 1	0	0

7.8   Example of Ladder Logic for Handshaking

Allen-Bradley Processors

The following example shows ladder logic to implement handshake between an AB Processor and the ToughMarquee.
After setting all the message bytes and message length, set Send-to-Marquee bit on for one scan. The ladder logic will set status byte bits to ensure that all the message bytes are delivered without loss.
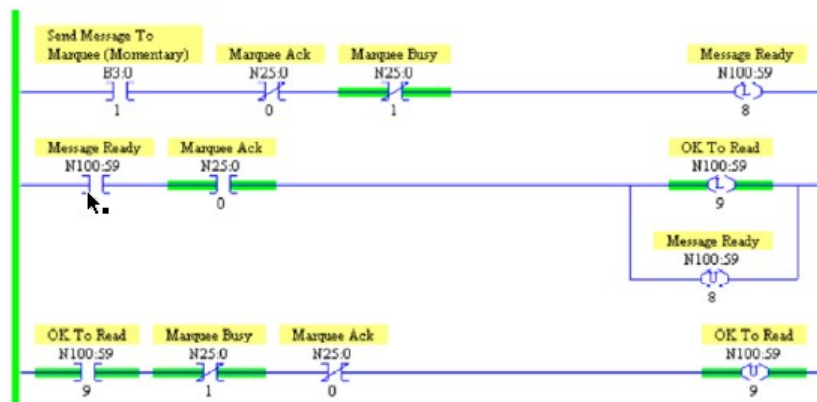
For other processors, please implement logic equivalent to the logic above.